NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

MBA PROFESSIONAL REPORT

Implementing Transformation:
An Analysis of Marine
Direct Air Support Requirements

By: **Scott E. Willette**

December 2003

Advisors: **Ken Doerr,**
Phil Candreva

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 2003	MBA Professional Report

4. TITLE AND SUBTITLE: Implementing Transformation: An Analysis of Marine Direct Air Support Requirements

5. FUNDING NUMBERS

6. AUTHOR(S) Scott E. Willette

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
N/A

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this report are those of the author(s) and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (maximum 200 words)

The purpose of this MBA Project was to focus on the Marine Direct Air Support Center and the information systems the Marine Corps is fielding to it as part of the Department of Defense's Transformation. As the nexus between air support and the ground combat element, the DASC executes and integrates the current day's Air Tasking Order with the ground element's fires. Interview responses from participants in Operation Iraqi Freedom identified difficulties the DASC encountered in implementing this emerging technology. This project analyzed the strategic alignment of the DASC by identifying any gaps in the links between its business strategy, organizational infrastructure and processes, IT strategy, and information systems infrastructure and processes. It did so by first determining how the current transformation effort was perceived by members of the DASC community; analyzed how transformation technology was implemented in Operation Iraqi Freedom from a Systems Analysis perspective; and developed an operating definition of what a transformed DASC will be like. These perspectives were then applied to the Strategic Alignment Model (SAM), developed by Henderson and Venkatraman, to help clarify the fit between the current state of the DASC and where it needs to be in terms of organization and IT to meet the requirements of Transformation.

14. SUBJECT TERMS
Strategic Alignment, Information Technology, Military Transformation, Systems Analysis

15. NUMBER OF PAGES
94

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

IMPLEMENTING TRANSFORMATION: AN ANALYSIS OF MARINE DIRECT AIR SUPPORT REQUIREMENTS

Scott E. Willette
Captain, United States Marine Corps
B.A., Oregon State University, 1998

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF BUSINESS ADMINISTRATION

from the

NAVAL POSTGRADUATE SCHOOL
December 2003

Author: _____
Scott Willette

Approved by: _____
Ken Doerr
Lead Advisor

_____
Phil Candreva
Support Advisor

_____
Douglas A. Brook, Dean
Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

IMPLEMENTING TRANSFORMATION: AN ANALYSIS OF MARINE DIRECT AIR SUPPORT REQUIREMENTS

ABSTRACT

The purpose of this MBA Project was to focus on the Marine Direct Air Support Center and the information systems the Marine Corps is fielding to it as part of the Department of Defense's Transformation. As the nexus between air support and the ground combat element, the DASC executes and integrates the current day's Air Tasking Order with the ground element's fires. Interview responses from participants in Operation Iraqi Freedom identified difficulties the DASC encountered in implementing this emerging technology. This project analyzed the strategic alignment of the DASC by identifying any gaps in the links between its business strategy, organizational infrastructure and processes, IT strategy, and information systems infrastructure and processes. It did so by first determining how the current transformation effort was perceived by members of the DASC community; analyzed how transformation technology was implemented in Operation Iraqi Freedom from a Systems Analysis perspective; and developed an operating definition of what a transformed DASC will be like. These perspectives were then applied to the Strategic Alignment Model (SAM), developed by Henderson and Venkatraman, to help clarify the fit between the current state of the DASC and where it needs to be in terms of organization and IT to meet the requirements of Transformation.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I. INTRODUCTION....1
A. BACKGROUND....1
B. PURPOSE....3
C. SCOPE AND ORGANIZATION....4
D. METHODOLGY AND RESEARCH PROTOCOL....6
1. Objectives and Research Issues....6
2. Field Procedures....6
a. Researcher Credentials....6
b. Site Specifications....7
c. Sources of Information....7
3. Case Study Questions....7
a. Data Collection....7
b. Research Questions....8
c. Method of Data Analysis....8
d. Validity....9
e. Reliability....9

II. ALIGNING BUSINESS AND IT STRATEGY....11
A. BUSINESS STRATEGY....11
B. IT STRATEGY....12
C. ORGANIZATION INFRASTRUCTURE AND PROCESSES....13
D. IT INFRASTRUCTURE AND PROCESSES....14
E. THE STRATEGIC ALIGNMENT MODEL PERSPECTIVES....14
1. Perspectives....15
a. Strategy Execution....16
b. Technology Transformation....16
c. Competitive Potential....17
d. Service Level....18
2. Other Perspectives....18
a. Organizational IT Infrastructure....19
b. IT Infrastructure Strategy....19
c. IT Organizational Infrastructure....19
d. Organizational Infrastructure Strategy....20

III. EXTERNAL BUSINESS AND IT STRATEGY....21
A. DEPARTMENT OF DEFENSE TRANSFORMATION....21
1. Transforming How We Do Business....22
2. Transforming How We Work With Others....22
3. Transforming How We Fight....22
B. NAVY AND MARINE CORPS TRANSFORMATION....23
C. TRANSFORMATION OF MARINE CORPS AVIATION COMMAND AND CONTROL....24

D. MACCS IT STRATEGY 26
1. Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) for the 21st Century 26
2. MACCS IT Systems 26
3. MACCS Future Systems 27

IV. DASC ORGANIZATIONAL INFRASTRUCTURE AND PROCESSES 29
A. CURRENT ADMINISTRATIVE STRUCTURE 29
B. DASC PROCESSES 32
C. DASC SKILLS 32
D. THE FUTURE OF DIRECT AIR SUPPORT: INTERNAL ORGANIZATION 33
E. THE FUTURE OF DIRECT AIR SUPPORT: PROCESSES 35
F. THE FUTURE OF DIRECT AIR SUPPORT: SKILLS 36

V. DASC IT INFRASTRUCTURE AND PROCESSES DURING OPERATION IRAQI FREEDOM 38
A. DASC DATA FLOW 38
B. SYSTEMS ANALYSIS 47

VI. ANALYSIS OF THE DASC STRATEGIC ALIGNMENT MODEL 52
A. PERSPECTIVES AND THEIR MEANINGS 52
1. Competitive Potential 53
2. Technology Transformation 54
3. Organizational Infrastructure 55
B. THE IMPACT OF MULTIPLE PERSPECTIVES 56

APPENDIX A - INTERNAL DASC ORGANIZATION (MCWP 3-25.5) 66

APPENDIX B - FIELD RESEARCH INTERVIEW SCHEDULE 72

LIST OF REFERENCES 76

INITIAL DISTRIBUTION LIST 78

LIST OF FIGURES

Figure 1. The Strategic Alignment Model (After: Henderson and Venkatraman 1993) 3
Figure 2. Strategy Execution Perspective (From: Henderson & Venkatraman, 1993) ...16
Figure 3. Technology Transformation Perspective (From: Henderson & Venkatraman, 1993)....16
Figure 4. Competitive Potential Perspective (From: Henderson & Venkatraman, 1993) 17
Figure 5. Service Level Perspective (From: Henderson & Venkatraman, 1993).....18
Figure 6. Other Perspectives (From: Papp & Luftman, 1995) 19
Figure 7. Marine Air Control Group Organization Chart (After: Department of the Navy, 2001)....30
Figure 8. DASC Organization (From: MCWP 3-25.5) 31
Figure 9. DASC Context Diagram (Level 0) 39
Figure 10. DASC Level One Diagram 43
Figure 11. DASC Common Tactical Picture Level Two Diagram 46

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

Table 1. DASC Contextual Diagram Data Dictionary....41
Table 2. DASC Data Store Dictionary....42
Table 3. DASC Level One Diagram Data Dictionary....44
Table 4. Enablers and Inhibitors to Strategic Alignment (After: Luftman & Brier, 1999)....58

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

I want to thank Dr. Doerr and CDR Candreva for their insistence that this work be given the full treatment that it deserves. In addition, without the untiring patience of my wife, Chay, I would not be where I am today.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. BACKGROUND

As the Department of Defense (DoD) transforms itself into a fighting force for the 21st century, changes at the tactical level may or may not reflect the intentions of DoD's senior leadership. The alignment between corporate strategies, business (or tactical) functions, and the strategies for designing and implementing Information Technology (IT), are vital to success on the modern battlefield. The Marine Corps has perpetuated an ethos of adaptability that lends itself to the DoD's transformation initiative, but to what extent?

Although the doctrine of transformation is still new, its effects are already being felt at the tactical level. Traditional reliance on radio networks to call for, process and control immediate air missions are giving way to digital networks, management information systems and decision support systems. These systems have begun to appear in tactical units throughout the Marine Corps, including the aviation command and control community. As with any new system, early integration into existing doctrine and tactics, techniques and procedures, has encountered a few problems.

The Marine Aviation Command and Control System (MACCS) consists of various air command and control agencies designed to provide the Marine air-ground task force's (MAGTF's) aviation combat element (ACE) commander with the ability to supervise the application of Marine aviation in support of the MAGTF Commander. The MACCS provides the ACE commander with the air command and control support facilities and infrastructure necessary to command, coordinate, and control air operations. Principal MACCS agencies are composed of air command and control suites that integrate manual and automatic systems to provide air control and direction.

One of those agencies, the Direct Air Support Center (DASC) has fielded both legacy (the Advanced Field Artillery Tactical Data System) and what could be considered transformational (the Theater Battle Management Core System) systems. More detail on

these systems is presented in the section on the DASC. For now, it is sufficient to note that these are the primary automated systems for the DASC.

From experience in the development and fielding of these systems, the author noted several problems in attempting to create a seamlessly automated DASC. Problems implementing an automated air support system were seen to stem from interoperability failures identified in these new systems during development and operational testing, the wide variety of employment configurations of the Marine Corps' Direct Air Support Center (DASC), or a lack of standardized procedures for automated processing of immediate requests (possibly due to a combination of the two previous problems and organizational blocks).

In addition, new concepts and equipment, such as the Universal Operations Center (UOC) and the Common Aviation Command and Control Suite (CAC2S), will be developed and fielded in the midterm (next 5-10 years). The UOC/CAC2S is going to be composed of modular, scalable nodes capable of integrating both legacy and transformational IT systems functionality. The problem is one of aligning the dual objectives of business and IT strategy transformation to ensure the direct air support function of the future is better equipped and more capable.

Many researchers have addressed the problems encountered in aligning business and IT strategy (Luftman, 1996). In 1993, Henderson and Venkatraman presented the Strategic Alignment Model (Henderson & Venkatraman, 1993), as a way of diagnosing the fit between business strategy, organizational infrastructure and processes, IT strategy, and information systems infrastructure and processes (see Figure 1 on the next page). This model has been accepted and reused by researchers (Burn & Szeto, 2000; Kearns & Lederer 2003) to describe an organization's perceptions of alignment and analyze the accuracy of those perceptions.

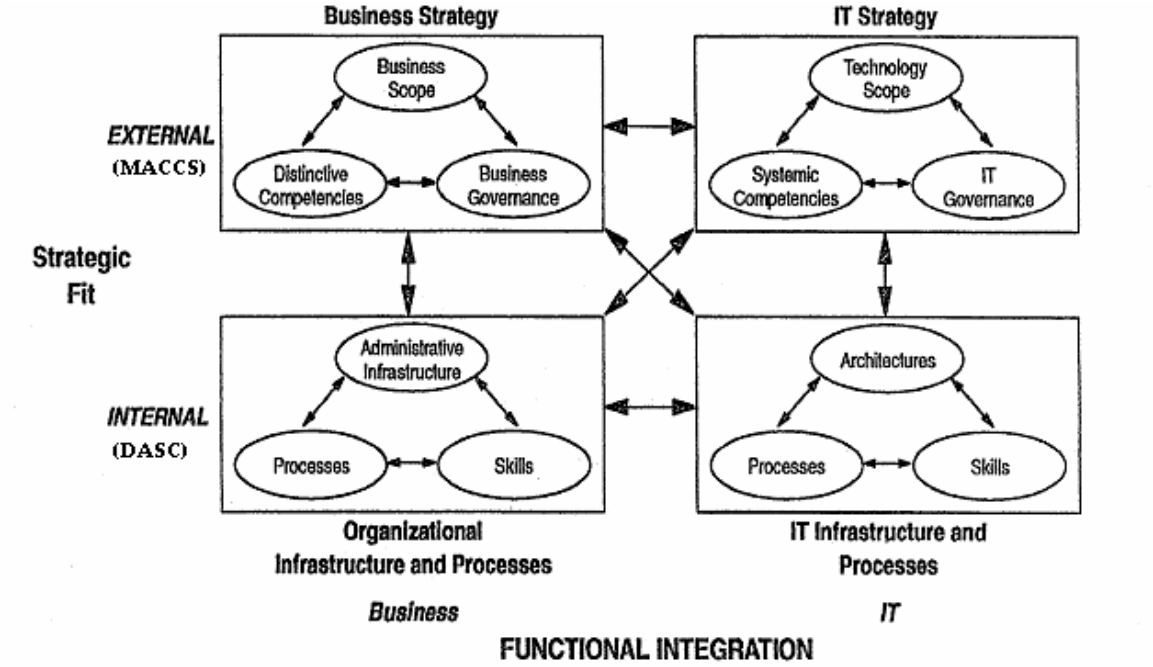

Figure 1. The Strategic Alignment Model (After: Henderson and Venkatraman 1993)

B. PURPOSE

This project focuses on the information systems the Marine Corps is procuring for the DASC and as part of the Department of Defense's Transformation. Participants in Operation Iraqi Freedom (OIF) identified difficulties the DASC encountered in implementing this emerging technology. Initial analysis suggested that the future organizational infrastructure and processes required of the DASC have not been formally determined.

The specific objectives for this research were to

1) Identify the views of senior DASC and MACCS leadership on the strength of the MACCS business strategy and its capability to determine the scope, distinctive competencies, and governance envisioned in transforming direct air support.

2) Again, from the same respondents, with additional input from DASC officers and senior enlisted Marines, identify their vision for the structure, processes and skills of the future direct air support node in order to create an operational definition for the organizational infrastructure and processes domain.

3) Determine, using a systems analysis perspective, the advantages and disadvantages of the tactical data system architecture, processes and operator skills that were used during OIF through interviews with those Marines who had the most contact with these systems.

4) Analyze objectives one through three to determine if the alignment perspectives predicted by the SAM were present, to what extent, and how this compares to the expected perspectives outlined in current MACCS and DASC Transformation literature.

C. SCOPE AND ORGANIZATION

This study will begin with a presentation of the literature that exists concerning strategic alignment. It will then present the model and proceed to analyze the DASC from a strategic alignment perspective. In order to use the SAM, the organizational and information systems infrastructure and processes internal to the DASC will be defined in relation to the Marine Air Command and Control System's business and IT strategy. The literature search for the project reviewed the development and execution of corporate and business level IT strategy with a focus on implementation. The SAM is presented in detail in Chapter II.

Next the corporate strategy domain will be defined. For the DoD and Navy/Marine Corps Team, this process is continuous and involves defining the global security environment they will operate within in the long term. The DoD's *Transformation Planning Guidance*, the Navy's *Seapower 21*, and the Marine Corps' *Strategy 21* define this corporate strategy and are looked at in detail in Chapter III. Business strategy further refines corporate strategy by creating the short and midterm goals needed to achieve the strategic vision. Business strategy is used to explain how the Marine Corps will compete on the modern battlefield and includes its IT strategy.

Business strategy can be further refined into functional areas. Such is the case in the Marine Air Command and Control System (MACCS) papers *The Roadmap* and *MACCS Employment Options,* also covered in Chapter III. A definition of the IT

strategy domain will conclude Chapter III with a description of the MACCS' Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) initiatives.

Once the external business and IT strategies have been identified, this paper will address the internal structures and processes. Interviews were conducted to answer the questions detailed in the objectives and the results of those interviews are presented throughout this paper. First, due to the lack of an official description of what the transformed DASC will like, an operating definition, as described by both junior and senior members of the Aviation Command and Control community will be developed. The current organization and vision for the future of Direct Air Support will be developed in Chapter IV.

Next, in Chapter V, the DASC as it existed during OIF will be presented from a Systems Analysis perspective to highlight the incongruencies of fit between the IT infrastructure and business processes. Also, a detailed systems analysis of data flow within the DASC during Operation Iraqi Freedom will be presented which will describe how IT systems are currently organized within the DASC.

Chapter VI will analyze the perspectives on alignment found among the senior officer and enlisted Marines interviewed. These perspectives will be examined for their potential impact on development and fielding if transformation systems. The last chapter will take the identified perspectives, and known enablers and inhibitors to alignment, to make recommendations for strengthening the strategic alignment of the DASC.

Although the SAM is necessarily a cross-level model, for the purposes of analysis all data will be collected and analyzed at the lower level of that model, i.e., at the DASC level. Thus, although the conclusions of this research may have implications for other units within the MACCS, and indeed, to other organizations and sub-units within the Marine Corps, those implications will not be examined in detail, and remain outside the scope of this project.

D. METHODOLGY AND RESEARCH PROTOCOL

This section will outline the procedures used to define the domains of the Strategic Alignment Model and present arguments for its validity and reliability for use in the DoD setting.

1. Objectives and Research Issues

The primary analytic task of this project is the application of the Strategic Alignment Model (SAM) to the business processes of the MACCS and the DASC, and the IT processes that support them. Accomplishing this task required the instantiation and critical assessment of the four domains of model, and their linkages.

Since this is essentially qualitative research, the case study method was used to collect and analyze the processes, and interpretation of the roles, of IT in the MACCS and DASC. Case study research has been shown to be particularly well suited to testing the presence or absence of the expected elements of an existing theory like the SAM (Yin, 1994). The main elements of a Case Study are a) the research questions (see the Field Research Interview Schedule appendix), b) the tested theory (the SAM), c) identifiable units of analysis (in this case the perspectives found within the SAM), d) the specific methods used (covered below) and e) a criteria for evaluating the interview schedule and results for validity and reliability (also covered later) (Lee, 1999).

2. Field Procedures

Field procedures, if set up and executed properly (Lee, 1999), can add elements of reliability to a case study. The field procedures for this study were taken from suggestions by Lee.

a. Researcher Credentials

The researcher is a DASC officer with over 13 years in the Marine Corps, including seven years in the DASC and three in the Infantry. As a school-trained Weapons and Tactics Instructor, he was responsible for both the training of DASC officers and enlisted Marines, as well as providing Marine Aviation Command and Control battlestaff planning to the Air Combat Element and 1st Marine Division. As the lead Tactical Data Systems evaluator for Marine Air Support Squadron 3, he participated in numerous Operational Test and Evaluation Exercises for many of the IT systems in the

DASC and wrote the DASC Standard Operating Procedures for the Advanced Field Artillery Tactical Data System.

b. Site Specifications

Data on systems use and performance during OIF were collected from Marine Corps Base Camp Pendleton and Marine Corps Air Station Miramar in San Diego, California. Camp Pendleton is the home base of the First Marine Expeditionary Force, the senior Marine unit deployed to Operation Iraqi Freedom. Additional data was collected via telephone interviews with personnel stationed at Marine Aviation Weapons and Tactics Squadron 1 in Yuma, Arizona and the Aviation Command and Control Branch of the Aviation Department at Headquarters, United States Marine Corps in Washington, D.C.

c. Sources of Information

The business and IT strategy of the MACCS were instantiated primarily through published literature and semi-structured interviews, as was the infrastructure, architecture and skills of the DASC. The interview schedule was used to validate the SAM and its applicability to defining business and IT alignment in a Marine Corps tactical environment. This included both archival and interview data collected from DASC Marines and MACCS leadership in the 3rd Marine Aircraft Wing, DASC subject matter experts at Marine Aviation Weapons and Tactics Squadron 1, and the Aviation Command and Control Advocates at HQMC. All interviews were audio taped for later transcription.

3. Case Study Questions

The case study questions were designed to instantiate the SAM, provide senior tactical leadership views on alignment, and develop a systems analysis model of the DASC during Operation Iraqi Freedom.

a. Data Collection

This research protocol and the accompanying interview schedule were developed following standard methods (Lee, 1999; Rosenthal & Rosnow, 1991). A pilot test was conducted using personnel familiar with (but not currently assigned to) the

MACCS/DASC, and the interview schedule was modified to allow the questions on alignment to be better understood. Pilot test responses were not used in the coding and analysis phase.

b. Research Questions

The questions used to evaluate objectives one through three were presented during a semi-structured conversational interview. The interview schedule used pre-existing open-ended questions designed to stimulate a discussion of the interviewees' opinions and views. Similar to both the Luftman and Brier (1999) and Burn and Szeto (1999) instruments, the schedule focused on determining how the interviewees think strategic alignment is being attained within the MACCS and DASC. Specifically, the questions for Objectives one and two were asked of Marines serving as Senior Air Directors/Crew Chiefs or higher during OIF. These questions were asked in the order conducted by Luftman and Brier (1996) to determine the interviewee's perceptions of the relative strengths of the domains found in the SAM. This helped identify the perspectives found in the community and which were then mapped to the SAM to measure fit and confirm whether the model is valid for the DASC. The group of senior Marines were also asked the questions used to define the operating definition required by Objective three. The questions used to evaluate Objective four were designed to identify all external agencies that input and received data from the DASC, how that information was processed within the DASC, and what communication mediums were used to transfer the data during OIF.

c. Method of Data Analysis

Interviews were coded and analyzed using NVIVO® software (Richards, 1999), which was also used to develop and instantiate the linkages in the model and address the issues in Objective five. The processes of the DASC were captured using standard Systems Analysis methodologies (Kowal, 1988). Entity-relationship diagrams, and where necessary, data-flow diagrams were used to portray the essential elements of the processes. Subject-matter experts working in the DASC, and on IT systems for the DASC validated these diagrams at the end of the interview process. Specific techniques for analyzing the data included pattern matching and matching independent variables

(Lee, 1999). These techniques were used to determine if expected patterns from the SAM, could be fit to the interviewees' responses by specifying the combination of domains that would define that perspective and observing if that combination occurs. In every interview, the model was validated, as all interviewees' perceptions were congruent with the model's perspectives.

d. Validity

Lee (1999) addresses several issues concerning validity. Construct validity describes the ability of the interview schedule to actually measure the patterns expected of by the SAM within the sample of interviewees. External validity asks whether the case study can be repeated elsewhere. To address these two issues this protocol drew several tactics from Yin (1994).

1) The research protocol used multiple sources of evidence by interviewing personnel from both within and outside (but connected to) the DASC. In addition, written materials such as logbooks and after-action items were analyzed.

2) The research protocol established a chain of evidence by demonstrating the interview schedule follows a "logical progression of data" (Lee, 1999). This was accomplished by using a developed theory to construct the schedule, in this case the SAM.

3) The research protocol had the interviewees review the analysis of their interviews for accuracy. This was conducted by emailing the transcribed interviews to the interviewees. All transcriptions were validated.

4) As for external validity, this research case made the assumption that since both Luftman and Brier (1999) and Burn and Szeto (1999) have been able to successfully use the SAM to identify strategic perspectives across multiple industries, there was a strong probability that it could be used within the Marine Corps.

e. Reliability

Reliability relates to the analysis applied to the results of the interviews and its ability to accurately reflect what the interviewees meant. Yin (1994) also addressed reliability and his following suggestions were incorporated as well.

1) Write a thorough case protocol in order to ensure the test can be repeated with the same expected results.

2) The data must be presentable in a database in a logical meaningful manner. This was accomplished using the NVIVO® software (Richards, 1999).

3) Transcription reliability (Lee, 1999) can be adequately ensured by having an independent observer read the transcribed conversations while listening to the audiotape. A very patient independent observer mentioned in the acknowledgments did this for hours on end.

II. ALIGNING BUSINESS AND IT STRATEGY

Questions regarding exactly how to align a corporation's business and IT strategies have essentially revolved around a basic conundrum: Does available technology drive your business processes or do your processes dictate the types of IT you will implement? (Venkatraman, 1994) Volumes have been written on this subject, from both the IT and corporate perspectives. The answer, though, appears to be somewhere in the middle. Though it may sound contrite, the answer to what should be the driver of change in an organization really should be, "it depends." It depends on the value of the IT to the organization; it depends on the level of need for business process reengineering; and it depends on the type and cost of the technology available.

The real question to ask, then, is not whether technology is driving change, or vice versa, but rather what is the fit between business and IT? The Strategic Alignment Model addresses this question by pointing out that there are two questions to ask of any given corporation: what is the strength of the link between external business and IT strategy – called strategic integration, and what is the strength of the link between internal business processes and the physical IT architecture that supports it – called operational integration (Henderson & Venkatraman, 1999). In order to understand the relationship between this strategic fit and functional integration, Henderson and Venkatraman outlined the four domains shown in Figure 1. The definition of these domains, and their interaction, will be discussed in the following sections. For ease of reading, the rest of this chapter relies heavily on the Henderson and Venkatraman work previously cited.

A. BUSINESS STRATEGY

Defining a business strategy is vital to success. In the corporate world, it defines how and where a business is going to compete. On the battlefield however, business strategy becomes a more serious game, with not just survival, but victory as the goal. A firm's business strategy includes decisions on its scope, distinctive competencies and

governance (Luftman & Brier, 1999). As will be seen, there are distinct parallels with these three elements in the military.

Business scope defines where the corporation competes. For corporations this includes a definition of their markets and a *strengths, weaknesses, opportunities, and threats* (SWOT) analysis of those markets and their competitors. The military conducts exactly the same kinds of analyses from the strategic level National Military Strategy all the way down to a tactical Estimate of the Situation (Mission, Enemy, Terrain and Weather, Troops and Fire Support Available, and Time Available).

Distinctive Competencies are those things that are at the core of a business that make it competitive. A business develops these core competencies over time, modifying or weeding out those that do not contribute to the overall success of the enterprise. The military has done much the same thing through the specialization of its branches of the armed services. The Navy's core competencies focus control of the seas. The Marines give the Navy the capability to project power ashore. The Army has excelled in developing its ground combat capabilities. And the Air Force specializes in long-range interdiction of the battlefield.

Business governance describes how a corporation chooses to enter a particular market. Issues that need to be addressed include whether to go it alone, or attempt to form partnerships and relationships with other companies. In the Transformation Planning Guidance Secretary Rumsfeld states that, "it is in our interest to make arrangements for international military cooperation to ensure that rapidly transforming U.S. capabilities can be applied effectively with allied and coalition capabilities." Thus, the DoD recognizes the inherent advantage to creating systems that are both joint and interoperable with our allies as will be shown in Chapter III.

B. IT STRATEGY

Defining the scope of what constitutes IT strategy is difficult at best. One such attempt to define IT strategy and how it is formulated is provided by Lederer and Sethi (1988), "The process of deciding the objectives for organizational computing and

identifying potential computer applications which the organization should implement." While this definition provides a broad overview of IT strategy, it does not cover sufficient ground for the purposes of this paper. The tie-in with the business strategy of an organization is essential to the success of an IT strategy. Thus, a more refined definition is needed.

K. Hugh Macdonald in his development of the Strategic Alignment Process (a linked-stages model for achieving strategic alignment using the SAM), defines IT strategy as being "derived from a global technology platform which represents the potential capability available to the organization and the key technical issues and trends to be taken into account" (Morton, 1991). This would seem to contrast with Henderson and Venkatraman's own definition, which is:

> Defined in terms of choices pertaining to the positioning of the business in the IT marketplace and is analogous to the business strategy. It is defined in terms of three basic dimensions: technology scope (articulated in terms of the range of IT capabilities of the organization, such as image processing, global banking networks, or electronic gateways); distinctive competencies (articulated in terms of the salient characteristics in the IT arena that distinguish the firm in the IT marketplace, such as connectivity capabilities, cost-performance, reliability, and safety); and IT governance (articulated in terms of the nature of cooperative relationships, such as joint ventures and strategic alliances in the IT arena.

While the first two definitions certainly have merit, given the detailed nature of Henderson and Venkatraman's own definition, this paper will use theirs in describing the external IT strategy of the MACCS in Chapter III.

C. ORGANIZATION INFRASTRUCTURE AND PROCESSES

From the SAM, the major themes within the internal business processes relate to the choices a business makes in regards to its administrative infrastructure, processes and skills. Venkatraman calls the results of these choices, "the particular internal arrangements and configurations that support the organization's chosen position" (Morton, 1991). Henderson, Venkatraman and Oldach (Luftman, 1996) go on to refine the three themes:

> (1) the administrative structure (functional or divisional or matrix organization), (2) the design or redesign of critical business processes (product delivery, product development, customer service), and (3) the acquisition and development of human resource skills.

When describing the current structure of the DASC and creating the operational definition of the future of direct air support in Chapter IV, this paper will focus on those three themes; internal organization, critical functions, and personnel training and development.

D. IT INFRASTRUCTURE AND PROCESSES

IT infrastructure and processes closely follow Organization Infrastructure and processes. Continuing with Henderson and Venkatraman's definitions, the internal IT domain has three aspects, IT architecture, IT processes, and IT skills. Keeping the sections for comparison within the same context allows for ease of analysis of the strengths of the linkages between the two domains. For the SAM these sections are:

> Defined in terms of choices pertaining to the internal arrangements that determine the data, applications, and technology infrastructure to deliver the required IT products and services (Luftman, 1996).

Again, given this definition, Chapter V will evaluate the data flow that existed in the DASC during Operation Iraqi Freedom. Specifically, the analysis will focus on the systems that were used, how information was routed (both manually and using information systems), and the required skills involved with not only maintaining the systems, but using them as well.

E. THE STRATEGIC ALIGNMENT MODEL PERSPECTIVES

Once the two external and two internal domains have been defined for a given organization there are several ways to apply the SAM. Henderson and Venkatraman developed the original model as a result of their research with the IBM Consulting Group. Throughout the 1980s IBM collaborated with the academic world to create a way of viewing, analyzing, describing and strengthening the relationship between business and IT. IBM Consulting then applied the resulting model with their clients (Luftman, 1996). Since its original development the SAM has been expanded as a result of a study

conducted at IBM's Advanced Business Institute from 1992-1994 (Papp & Luftman, 1995), and validated in separate trials (Burns & Szeto, 2000; Papp & Luftman, 1995a). As well, it has been turned into a process by which alignment can be achieved, but that will be covered in detail in Chapter VII. First, it is necessary to describe the perspectives that can be found within the model.

1. Perspectives

So what is alignment? Alignment is simply the integration of the four domains that produces the optimal outcome. When the IT strategy is correctly reflected in the internal architecture and both support the overall business strategy and day-to-day operations of an organization, at the best cost, then you have achieved optimal alignment. However, trying to align across all four domains simultaneously can be extremely difficult. The easiest way would be to align two domains at a time (Business strategy and IT strategy for example), but this would fail to take internal functions (reality) into consideration. Therefore, Henderson and Venkatraman described four multivariate relationships that align three of the domains on both the functional and strategic axis. These alignment perspectives, described below, begin with the identification of a driver for change in the organization. This is usually considered the strongest domain and so is called the anchor. The domain in the most need of strengthening, the pivot, is usually the area identified by the business leader as the one in need of changing. The third domain, called the impacted domain, is the one which will be most affected by a change in the anchor domain. The first two alignment perspectives identified by Henderson and Venkatraman focus on business strategy as the driving force for change, while the second two focus on the development of a strong IT strategy as the driver.

a. Strategy Execution

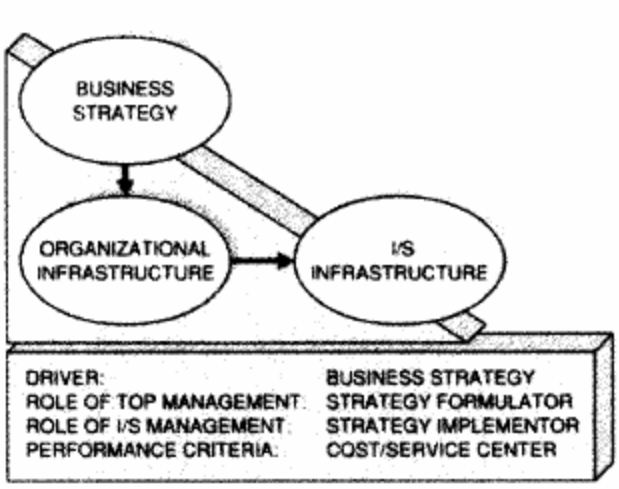

Figure 2. Strategy Execution Perspective (From: Henderson & Venkatraman, 1993)

This perspective reflects an organization that has a strong business strategy, but that is undergoing, or in need of, business process reengineering. Therefore the business strategy becomes the driver of both organizational, and ultimately IT, infrastructure. Henderson and Venkatraman note that this is the classical view of management and would therefore be expected to be the most prevalent perspective.

b. Technology Transformation

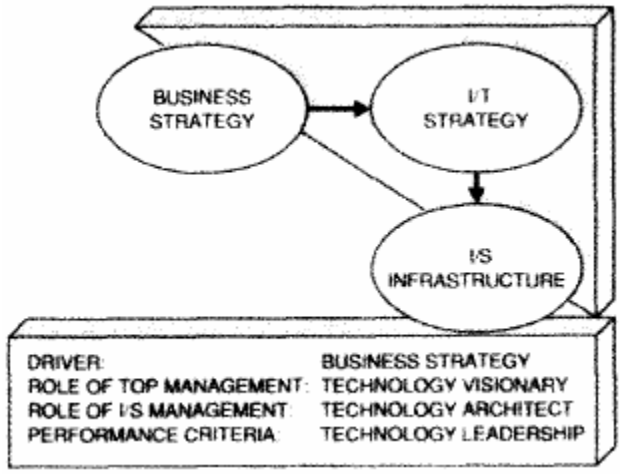

Figure 3. Technology Transformation Perspective (From: Henderson & Venkatraman, 1993)

This perspective tries to optimize the internal IT infrastructure by changing the IT strategy to better align with the overall business strategy. It is pursued by organizations that have identified an IT strategy through the development of their business strategy. This IT strategy is then used to design and create a system that supports it. Thus the business strategy, which identifies areas in which an organization plans to excel, defines the IT strategy to support those areas, leading to the design of an IT infrastructure that supports the business strategy.

c. Competitive Potential

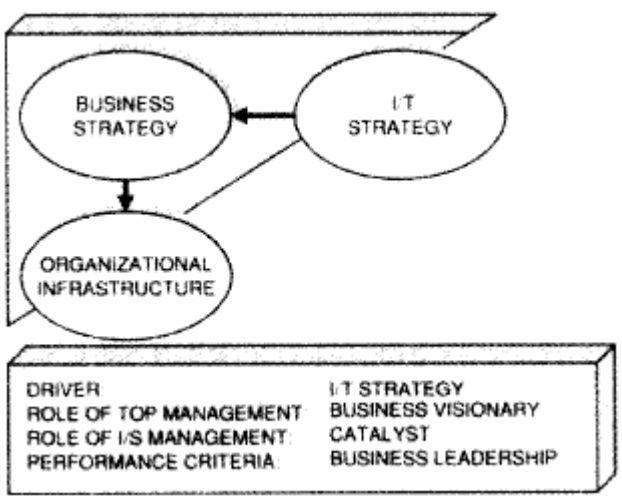

Figure 4. Competitive Potential Perspective (From: Henderson & Venkatraman, 1993)

Competitive potential involves the recognition by an organization that its strength lies in its technological superiority in some facet. Using this superiority to its advantage the organization adjusts its business model to take full advantage of the edge given by its technology, which affects the way it conducts business on a day-to-day basis. From this perspective, new or emerging technology is used to define what an organization is to become and then decide how to utilize that technology.

d. Service Level

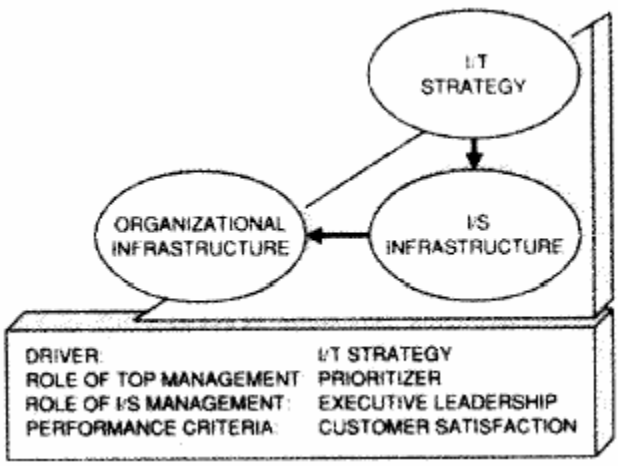

Figure 5. Service Level Perspective (From: Henderson & Venkatraman, 1993)

Customer satisfaction is the focus of a service level perspective. Using this perspective and organization uses its IT strategy drive changes to the IT architecture in order to provide the best possible services to the customer (in this case the user). By improving IT service the end user's time and capabilities are optimized, providing high quality service faster than before.

2. Other Perspectives

From 1992-1994, Papp and Luftman conducted a study of over 300 firms, applying the SAM to validate the perspectives outlined by Henderson and Venkatraman (Papp & Luftman, 1995a). While they were able to validate the domains and four perspectives, they found that four perspectives were inadequate to describe the range of ideas about aligning business and IT strategy. In fact, eight new perspectives were validated during the research (Papp & Luftman, 1995). In addition, the researchers found that the dominant perspectives varied by industry, and even by position within the company. This often led to several perspectives towards alignment within the same organization, which points to a stronger need for leadership to make its perspective clear and known. Of the eight new perspectives identified, four followed the same pattern identified by Henderson and Venkatraman and were described in *Competing in the Information Age* (Luftman, 1996). During the research for this paper, four of the new

perspectives, called fusion perspectives because they are combinations of existing perspectives, were not identified as existing in the DASC community. Therefore, the fusion perspectives are not given consideration here.

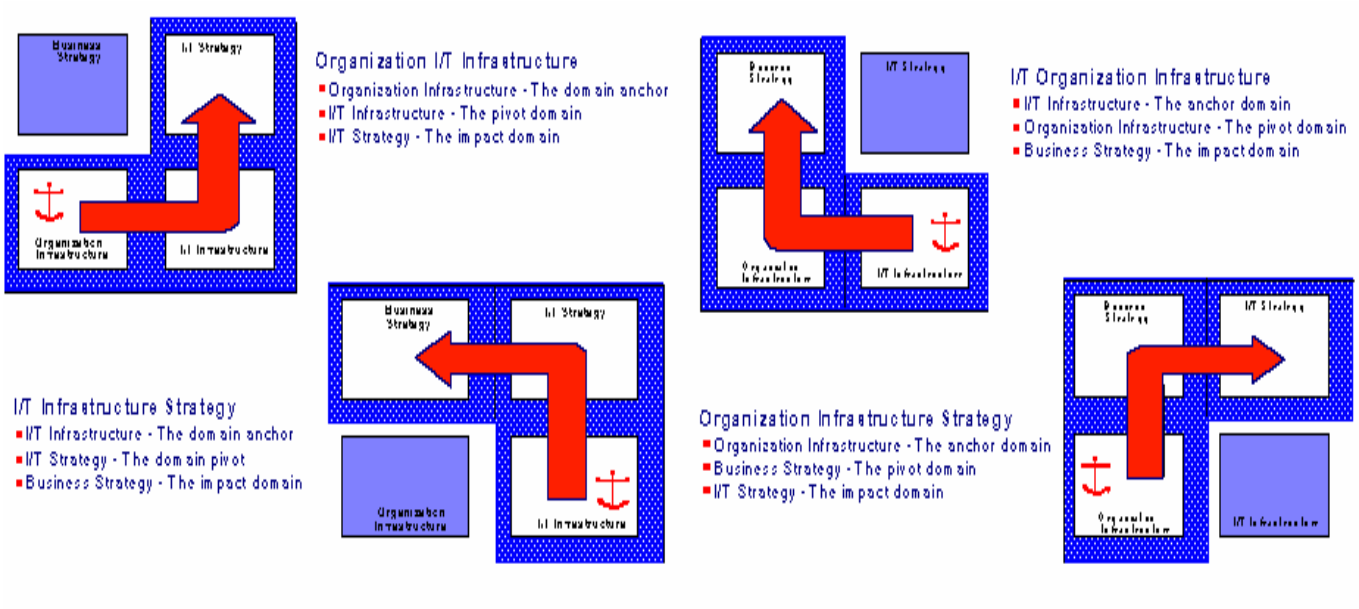

Figure 6. Other Perspectives (From: Papp & Luftman, 1995)

a. Organizational IT Infrastructure

This perspective is taken when a newly reengineered business process identifies the need for a change in IT architecture to support the new tasks and processes.

b. IT Infrastructure Strategy

From a military point of view, this perspective can occur when a current IT system is improved or modified to become more interoperable with other external systems. The organization is then better able to network and thus has to redefine its operating environment.

c. IT Organizational Infrastructure

This perspective is usually taken when an organization adapts its processes to fit a newly acquired IT system, changing its outlook in the process. This is the result of an 'IT drives strategy' approach that will only work if the organization is decentralized enough to allow bottom-up transformation with the IT manager playing a leading role.

d. Organizational Infrastructure Strategy

The organizational infrastructure strategy occurs when the results of a business reengineering process are used to define the corporate strategy, which leads to the adoption of a new IT strategy.

The next two chapters will be used to define the four domains of the SAM in terms of the Direct Air Support Center. Starting with the external business and IT strategy, followed by the organizational and IT infrastructures, this paper will then identify the dominant perspectives found among the DASC and MACCS senior leadership. Finally, the strength of the strategic alignment will be examined from the perspective of enablers and inhibitors to alignment, concluding with an analysis of their impact on achieving alignment within the DASC.

III. EXTERNAL BUSINESS AND IT STRATEGY

A. DEPARTMENT OF DEFENSE TRANSFORMATION

As Secretary of Defense Donald Rumsfeld took office in January 2001, he already had a clear understanding of his vision for the Department of Defense. His belief that the world was in a state of transformation has since been translated into a need for the military to undergo its own changes. At his swearing in ceremony, he identified the drivers for change.

> We may not be in the process of transition to something that will follow the Cold War. Rather, we may be in a period of continuing change, and if so, the sooner we wrap our heads around that fact, the sooner we can get about the business of making this nation and its citizens as safe and secure as they must be in our new national security environment. (Rumsfeld, 2001)

Later, at his introduction to the Pentagon and the military's senior leadership, he let the world know that the changes he envisioned would affect every aspect of the Department of Defense from strategy to budgeting.

> Make no mistake: keeping America safe in such a world is a challenge that's well within our reach, provided we work now and we work together to shape budgets, programs, strategies and force structure to meet threats we face and those that are emerging, and also to meet the opportunities we're offered to contribute to peace, stability and freedom. But the changes we make in our defense posture, the innovations we introduce, take time to be made part of a great military force. We need to get about the business of making these changes now in order to remain strong, not just in this decade, but also in decades to come. (Rumsfeld, 2001a)

Initially there was strong resistance to the idea that America was indeed threatened to the point that it needed to overhaul the entire National Security Strategy. However that all changed on September 11, 2001 when America was shown just how vulnerable it could be. But what were these changes? Moreover, what did they mean for the military?

1. Transforming How We Do Business

The Department of Defense is dedicated to realigning its business and acquisition strategies to reflect the changing dynamics of today's operational environment. To that end, it has streamlined the acquisition cycle time and introduced spiral development. Spiral development delivers new systems in increments, with a period for the end user to field and evaluate the new system at each increment. It also allows opportunities to rapidly inject new technology as a system develops. The program managers then incorporate what is learned in each new spiral, which is supposed to result in more reliable schedules and cost estimates.

2. Transforming How We Work With Others

As September 11th taught us, it is vital that all military components, indeed all federal Departments and Agencies, learn how to integrate at a national level. Only through information sharing, interdepartmental coordination, and system interoperability can national power be truly integrated.

3. Transforming How We Fight

Transforming how we fight includes development of future warfighting concepts across several military capability areas: doctrine, organization, material, leadership and education, personnel and facilities (Department of Defense, 2003). According to the *Transformation Planning Guidance* issued in April 2003, transforming our capabilities is the result of transforming our force. This research focuses almost solely on the impact the Transformation effort has on units at the tactical level, reflecting this particular goal of transformation.

Force Transformation will require our forces to be more network-centric and less platform-centric. Forces will be able to be distributed farther apart across the battlespace when information sharing becomes common to all units. Specifically, "U.S. forces will leverage asymmetric advantages to the fullest extent possible, drawing upon unparalleled Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C4ISR) capabilities that provide joint common relevant operational situational awareness of the battlespace, rapid and robust sensor-to-shooter targeting, reach back and other necessary prerequisites for network-centric warfare" (Department of

Defense, 2003). Thus, the development of a comprehensive C4ISR strategy is a key to transforming the DoD.

Now that the broad strokes of transformation have been defined, the rest of the chapter will begin to peel the layers off the onion to show how transformation is being implemented at the tactical level.

B. NAVY AND MARINE CORPS TRANSFORMATION

The Transformation Planning Guidance also mandates that the secretaries of the military departments and the service chiefs of staff develop Transformation Roadmaps that outline a plan of action towards fulfilling the change mandate. The Navy and the Marine Corps have long recognized the need to continuously evaluate their capabilities and requirements and several documents have been produced in recent years that define the Navy/Marine Corps' concept for the 21st Century.

The *Naval Transformation Roadmap: Power and Access…From the Sea* is the Navy's outline for implementing the DoD's transformation guidelines. It presents the transformational capabilities of Sea Strike, Sea Shield, and Sea Basing, each of which addresses specific Critical Operational Goals that have been identified by the DoD. All of these capabilities fall under the umbrella of FORCENet, which provides the architecture for the Navy/Marine Corps' network-centric warfare for the 21st century. This architecture is being designed to integrate all the C4ISR assets from the battlefield all the way to the Pentagon to provide a real-time common picture of the battlefield to all users of that information (Department of the Navy, 2003).

For the Marine Corps, these concepts found within the Navy's Sea Strike capability have been refined through several iterations; from *From the Sea* to *Forward…From the Sea* to *Operational Maneuver from the Sea* and *Ship-to-Objective Maneuver* and finally to the current capstone concepts embodied in *Seapower 21, Marine Corps Strategy 21* and *Expeditionary Maneuver Warfare*. Throughout these documents the Marine Corps has developed systems and processes to handle the requirements of change.

For example, a series of Commandant of the Marine Corps' Policy Memoranda (CMC Policy Memos) outlined the organization of the Expeditionary Force Development Center. These memoranda resulted in Marine Corps Order 3900.15A, *Marine Corps Expeditionary Force Development System* (EFDS), which identified the procedures for conducting the four phases in identifying and developing future capabilities: Force Capability Development, Requirement Development, Prioritization and Resourcing, and Capability Fielding and Transition (United States Marine Corps, 2002). The mission of the EFDS is to integrate all of these phases to ensure the warfighter is equipped with not only new C4ISR systems, but also the training and confidence in those systems required to use them effectively.

C. TRANSFORMATION OF MARINE CORPS AVIATION COMMAND AND CONTROL

In the Department of Defense Joint Capabilities Integration and Development System, requirements are translated into equipment, organization and capabilities at the tactical level (Chairman of the Joint Chiefs of Staff, 2003). When these three elements are congruent with each other at that level, we can say they are aligned. Strategic alignment is a process defined by the leaders of an organization that "begins by setting the organizational goals and establishes a team. The importance of setting a clear direction for the organization prior to selecting technologies and how they will be applied cannot be overlooked." (Luftman & Brier, 1999) In addition to defining the transformation process, the Marine Corps' EFDS formalized the guidance given in CMC Policy Memo 1-99, titled "Advocacy". This memo had identified the requirement for personnel stationed at Headquarters Marine Corps to be delineated as advocates for each element of the Marine Air-Ground Task Force. Among their many initiatives, advocates are responsible for being that link between the Fleet Marine Forces and the requirements generation and acquisition processes.

Advocacy for the Aviation Combat Element (ACE) fell to the Deputy Commandant, Aviation as head of the Aviation Department, Headquarters Marine Corps. The Aviation Department was further subdivided into advocates for the various functions

of Marine Aviation. The Aviation Command and Control Branch was delegated the task of producing concept papers for Air C2. These books were intended to provide direction to the MACCS concerning how it should train, organize, and equip for the 21st century. Subsequently two parts in a three part series have been approved and published.

Part One: The Roadmap, The Marine Air Command and Control System and Operational Maneuver from the Sea was published in December 1999. It outlined the goals for the MACCS in the 21st Century (streamlined information management/data fusion, expeditionary packaging, and the creation of information warriors) and detailed the systems that were in development to achieve those goals. Technological trends were predicted to, "result in a streamlined, networked air control system provided by the MACCS" (United States Marine Corps, 2001). In addition, the procedural control of aircraft, as explained in the next section, was foreseen to include a Single Integrated Air Picture (SIAP). A SIAP would bring a radar view of the airspace above the battlefield to Marines in the DASC who had never seen a radar picture before. Part One also predicted a shared data environment, which would allow the MACCS to interface with all other MAGTF agencies to obtain a real-time operational picture of the battlefield.

The second book, *Part Two: MACCS Employment Options, The Marine Air Command and Control System and Expeditionary Maneuver Warfare*, described how the MACCS would be employed to support the concepts found in the Marine Corps' transformational capstone concept, Expeditionary Maneuver Warfare. The employment options would need an operational architecture that supported numerous communications networks, could perform any or all of the functions of the MACCS, and was capable of deploying as an operational facility anywhere on the battlefield. Thus, the physical and organizational aspects of the future MACCS had to be flexible and scaleable as well as robust in its capabilities. Part Two stopped short of describing the technical details of how the C4ISR systems would be linked and used to create a systems architecture. One of the first attempts to create a seamless architecture was made during Operation Iraqi Freedom. We will be taking a look at that architecture within the DASC in Chapter V.

The third, as yet unpublished, book is supposed to show how the goals in Part One and the concepts in Part Two will affect the future organization, training and people

of the MACCS (United States Marine Corps, 1999). In a special report titled "State of Marine Aviation" to the May 2003 *Marine Corps Gazette*, Lt Gen Michael Hough, the Deputy Commandant for Aviation recognized the lack of a coherent definition of future MACCS agencies. To that end, he ordered the formation of a Transition Task Force (TTF), "to recommend doctrinal and organizational changes needed to fight and win in any global battlespace" (Hough, 2003). However, interviews with members of the TTF indicate that, due to Operations Enduring Freedom and Iraqi Freedom, work on the Transition Task Force has been slow in gaining momentum.

D. MACCS IT STRATEGY

The second domain to be defined is the external IT strategy. This is presented here as a top-down strategy from the DoD to the MACCS.

1. Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) for the 21st Century

The 2001 Quadrennial Defense Review identified six operational goals necessary to implement the new defense strategy. Four of these had either direct or indirect ties to the DoD's C4ISR strategy. The key one, "Leveraging information technology and innovative concepts to develop an interoperable, joint C4ISR architecture and capability that includes a tailorable joint picture" (DoD, 2003), is designed to specifically provide the warfighter with superior situational awareness and the capability to maneuver more easily across the battlespace.

In order to achieve this objective the Transformation Planning Guidance charges the Commander of Joint Forces Command to develop a plan that addresses the C4ISR priorities. These include a common relevant operational picture for joint forces and selected sensor-to-shooter linkages prioritized by contribution to the joint operating concepts.

2. MACCS IT Systems

In the last three years the MACCS has had two new tactical data systems added as systems of record. These systems represent a step in the incremental approach to achieving the vision found in Transformation documents. The Theater Battle

Management Core System (TBMCS) is a Joint mandated air-war planning tool for generation, dissemination and execution of the Air Tasking Order (ATO). The other system, the Advanced Field Artillery Tactical Data System (AFATDS), is an automated fire support command and control (C2) system that replaces aging systems, while adding additional fire support capabilities and providing a more robust hardware platform.

AFATDS is a Multi-Service fire support system utilized by both the US Army and US Marine Corps, thereby providing for digital fire support interoperability between the two services. Within the MACCS, AFATDS was intended to automate the reception of immediate air support requests, battlefield geometry and display real-time updates on current fire missions (including the active gun to target lines).

3. MACCS Future Systems

The future of IT systems in the MACCS resides in the development of the Common Aviation Command and Control Suite (CAC2S). CAC2S will modernize the capability of the MACCS to support the planning and execution of aviation operations. CAC2S will replace current legacy systems with a common suite of equipment. It will not replace air defense weapons, radios, or sensors organic to the MACCS, but will consolidate the existing functionality of legacy MACCS systems into a single system capable of performing those various functions with a common suite of equipment and software applications.

CAC2S will provide operators with planning and execution capabilities for aviation operations that will interface with legacy MACCS systems (i.e. AFATDS and TBMCS), current MAGTF C4I systems, jointly - mandated systems and future Joint and MAGTF C4I systems. It will allow operators to execute current operations while simultaneously conducting planning for future operations. The primary intent of the CAC2S is to ensure that the MACCS is capable of supporting MAGTF operations in both current and emerging operational environments. It will be built in three increments with each increment focusing on specific MACCS functions. The DASC suite will be fielded in Increment II, which is currently scheduled for mid-2007.

THIS PAGE INTENTIONALLY LEFT BLANK

IV. DASC ORGANIZATIONAL INFRASTRUCTURE AND PROCESSES

The Strategic Alignment Model identifies three elements within the internal business domain: Administrative Structure, Processes and Skills. Administrative Structure refers to the "roles, responsibilities, and authority structures of the enterprise" (Luftman, 1996) and focuses on typical organizational questions involving span of control, mechanistic vs. organic organization and the degree of functional integration. The Processes are those critical functions that the business unit performs to accomplish the goals outlined in the external strategy. Measures of effectiveness are designed around these mission essential tasks, attempting to ensure that only value-added activities are performed. The Skills required to perform the Processes involve such questions as the level and types of training required of the individual members and to what extent will new processes require new skills. This chapter will define the current organizational infrastructure and processes of the DASC, and then present the results of that part of the research involved with creating the operational definition of the organization, processes and skills required of the direct air support function of the near to mid-term. Throughout the rest of this study, any quotations without direct attributes were taken from the confidential interviews conducted in conjunction with this research.

A. CURRENT ADMINISTRATIVE STRUCTURE

As the nexus between air support and the ground combat element, the DASC is charged with executing and integrating the current day's Air Tasking Order (ATO) with the ground element's fires. The ATO is a document used to inform command and control agencies of projected aircraft sorties, targets and specific missions. Normally the ATO provides specific instructions to include call signs, targets, controlling agencies, etc., as well as general instructions.

As outlined in the Marine Corps Warfighting Publication (MCWP) 3-25.5, *Direct Air Support Center Handbook*, the DASC is the principal Marine air command and control system (MACCS) air control agency responsible for the direction of air operations directly supporting ground forces. It functions in a decentralized mode of

operation, but is directly supervised by the Marine Tactical Air Command Center (Marine TACC). The DASC's parent unit is the Marine Air Support Squadron of the Marine Air Control Group (see Figure 7). Thus, administratively, or on a day-to-day basis, the DASC does not exist as an entity. It is only during military exercises or real world operations that the DASC is formed from the Marine Air Support Squadron. The Marine Corps has four Marine Aircraft Wings (3 active and 1 reserve). Each Wing has an Air Control Group; therefore, there are four MASS units for the Marine Corps.

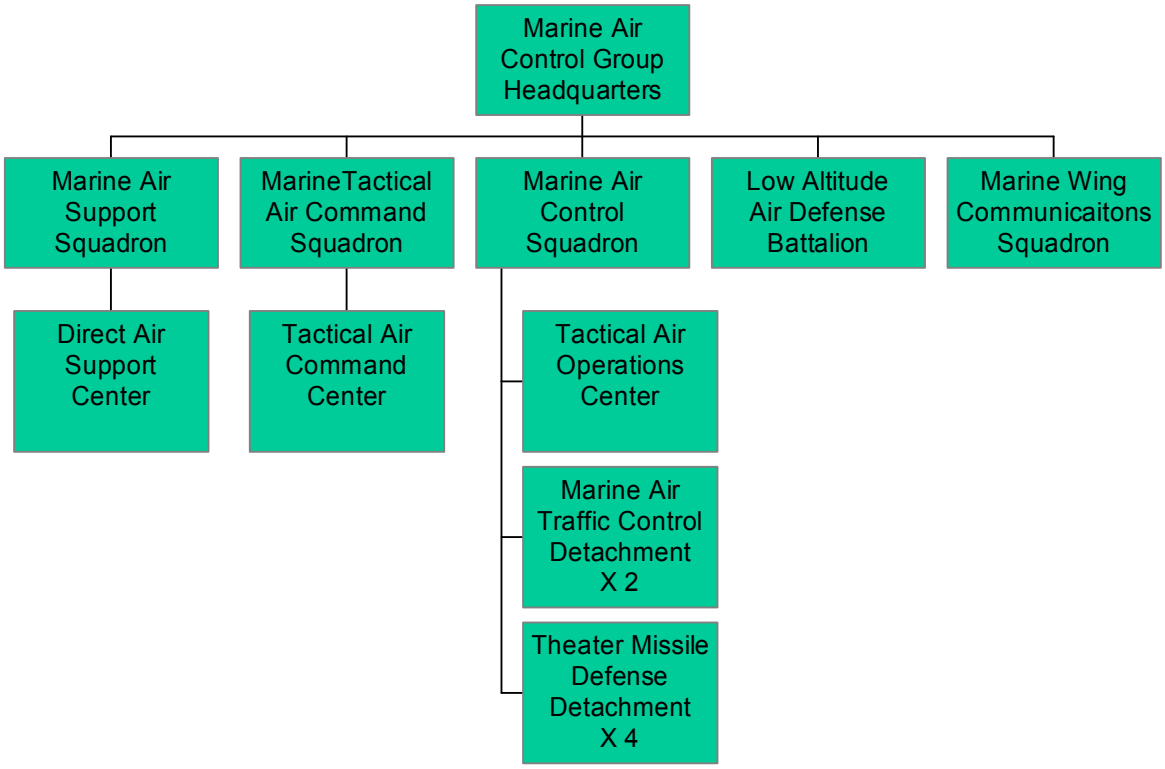

Figure 7. Marine Air Control Group Organization Chart (After: Department of the Navy, 2001)

Internal structure (reporting relationships, etc.) of a MASS is largely left up to the Commanding Officer, thus each MASS is organized slightly differently. In addition, each MASS supports a set of real-world Operations Plans. These Operations Plans may require the DASC to emphasize different aspects of their capabilities (i.e., one plan may rely more heavily on the use of an Airborne DASC than other plans). The result is that a DASC in one situation may be task-organized differently than another. The rest of this

section identifies the organization and tasks required of the DASC in general. The projections of the future of direct air support were taken from interviews with personnel involved in training, organizing, and equipping the DASC in direct support of the 1st Marine Division during Operation Iraqi Freedom. While this may bias their opinions towards the types of Operation Plans they support, most of the interviewees have also served in at least one other MASS and thus have a broader perspective on which they based their answers.

In general, the DASC crew is task-organized to meet operational requirements. Crewmembers are assigned positions based on their level of qualification and experience. Figure 8 on the next page shows a notional DASC organization. A full description of the individual positions and their tasks within the DASC can be found in the Internal DASC Organization appendix.

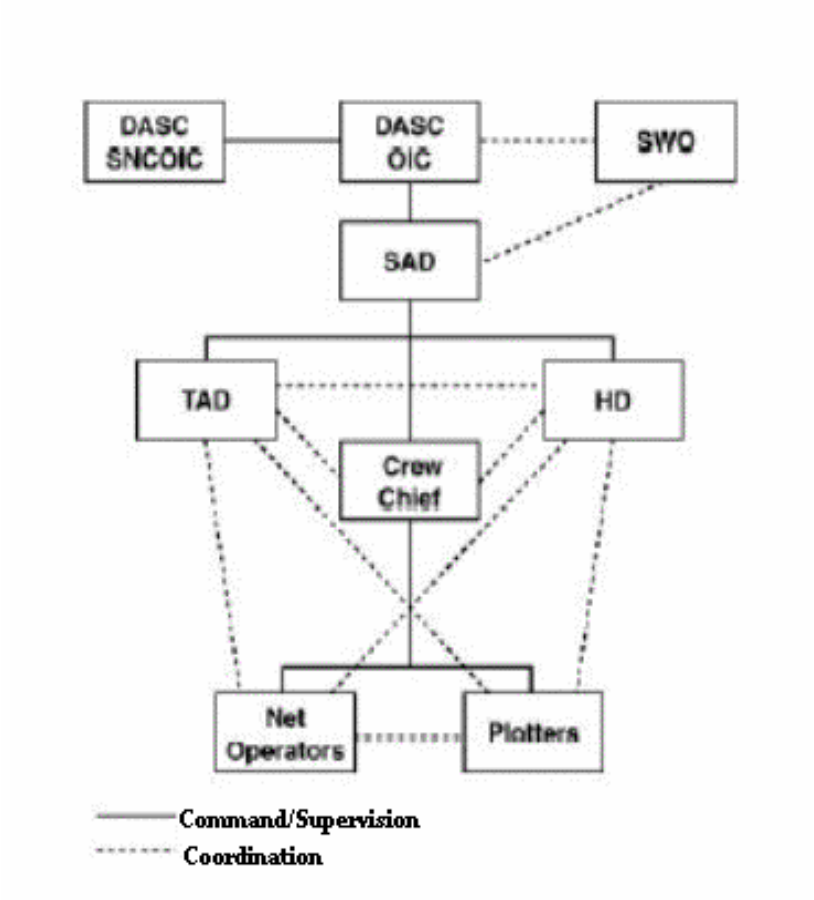

Figure 8. DASC Organization (From: MCWP 3-25.5)

B. DASC PROCESSES

The DASC processes immediate air support requests; coordinates aircraft employment with other supporting arms; manages terminal control assets supporting GCE and combat service support element forces; and controls assigned aircraft, unmanned aerial vehicles, and itinerant aircraft transiting through DASC controlled airspace. The DASC controls and directs air support activities affecting the ground combat commander's focus on close operations and those air missions requiring integration with the ground combat forces (close air support, assault support, and designated air reconnaissance). The DASC does not normally control aircraft conducting deep air support (DAS) missions as detailed coordination of DAS missions are not required with ground forces. Specific tasks of the DASC not previously mentioned include:

1. When delegated authority by the aviation combat element (ACE) commander and in coordination with the GCE's senior Fire Support Coordination Center (FSCC), adjusts preplanned schedules, diverts airborne assets, and launches aircraft as necessary.
2. Coordinates the execution of direct air support missions with other supporting arms through the appropriate FSCC and, as required, with the appropriate MACCS agencies.
3. Receives and disseminates pertinent tactical information reported by aircraft performing direct air support missions.
4. Provides aircraft and air control agencies with advisory and threat information to assist in the safe conduct of flight.
5. Monitors, records, and displays information on direct air support missions.
6. Maintains friendly and enemy ground situation display necessary to coordinate direct air support operations.
7. Provides direct air support aircraft and other MACCS agencies with information concerning the friendly and enemy situation.
8. Refers unresolved conflicts in supporting arms to the senior FSCC's fire support coordinator (FSC).

C. DASC SKILLS

All DASC officers and enlisted Marines attend a nine-week school in 29 Palms, California. Upon completion of the school, the officers are designated Air Support

Control Officers, and the enlisted are designated Air Support Net Operators. The nature of the DASC requires a close working relationship between the officers and enlisted. In keeping with this, they attend school at the same time and receive a major portion (29 out of 34 training days) of the entry-level training together, including working as a crew in a progressively more complex simulated combat environment.

Both officers and enlisted have a career progression model they follow which is a succession of required tasks and events based on numerical qualification levels that start at 100 and progress to 400. Officers and enlisted leave 29 Palms as 'Combat Capable' qualified at level 100. Once the new officers and enlisted arrive at their first duty station, they begin the process of achieving the rest of their qualifications.

Level 200 qualifications for officers, or 'Combat Ready,' occurs upon successful completion of the requirements for qualification as a Tactical Air Director (for fixed-wing aircraft) and Helicopter Director. Level 300, or 'Combat Qualified', is achieved upon qualification as a Senior Air Director. The final qualification at level 400, 'Full Combat Qualified,' occurs at the Marine Corps' Weapons and Tactics Instructors School in Yuma, Arizona.

The enlisted Marines follow a similar career progression, however once they complete their level 300 qualifications (Fire Support Coordination Net Operator, Tactical Air Request/Helicopter Request Net Operator and Tactical Air Control/Direct Air Support Net Operator), they start over at level 100 as Crew Chief's in training.

D. THE FUTURE OF DIRECT AIR SUPPORT: INTERNAL ORGANIZATION

The future of the internal organization of the DASC is as much one of where the direct air support function should be located as how it should look internally. All of those interviewed pointed out the dichotomous nature of the DASC in its relationship between the Air Combat Element (ACE, the DASC's boss) and the Ground Combat Element (the supported unit). The DASC responds to the Ground Combat Element (GCE) Commander's requirements for direct air support by processing immediate air support requests, coordinating aircraft employment with other supporting arms through

the GCE's senior Fire Support Coordination Center (FSCC), and directing designated air operations. The DASC's role in direct air support thus provides a crucial linkage between the GCE and the ACE, and thus the physical location requires careful consideration of both roles.

When considering location of the DASC the interviewees all acknowledged the trend towards physical collocation with the senior FSCC.

> We were as decentralized during the last deployment, during OIF, as probably any DASC has ever been. And that was driven by geography and by the organization on the ground…I believe that there is more of a natural tendency toward a fusion of fires and air support from the ground commander's perspective…

While this trend towards becoming a part of the FSCC is acknowledged, it is not universally agreed upon. Many of the respondents pointed to the development of technology as an impetus for being able to distance the DASC from the FSCC.

> And with data the way it is, it actually shortens the distances between the agencies to the point that it doesn't matter that the DASC is over here, or over there, or collocated…

These interviewees felt that the trend towards integration would bias the DASC towards the GCE when applying air assets:

> If we get sucked up by them, there's no way you can do that [*remain unbiased*]. If you're a part of them, you want them to succeed. It's the whole Helsinki Syndrome.

In fact, several suggested that improvements in technology could reverse the trend, putting the DASC closer to the TACC (much further away from the supported units) than ever before.

> Because if I can communicate that decision, I don't need to be that far forward. It's sort of like electronic collocation…you can virtually transmit the decisions of the DASC, if you had good comms [*communications*], from anywhere on the battlefield…you might do them at the TACC.

Views on the future internal organization of the DASC are just as varied as those of where it should be located. Ideas ranged from a matrix-like organizational structure spread out on the battlefield with interconnecting nodes providing a redundant network;

to a vertically connected system similar to the Army Airspace Command and Control made up of increasingly smaller nodes down to the battalion level. However, what everyone interviewed agreed upon was that the current DASC does not have enough assets and personnel to provide the air support for a multiple division GCE. The multiple division GCE was used in OIF and, in fact, is built into most of the existing operations plans. As one senior officer put it:

> I think they [*the DASC*] are going to reorganize because there are people that think we need to reorganize. The reason I don't like it is, if you have an Air Command and Control Battalion that has all those functions that we currently know as MASS, LAAD…all those functions falling under one flag, one unit, there isn't enough of any one function to field a capability that is big enough for a major theater war.

What this alludes to is that the MASS is designed, in strength and equipment, to support the Marine Expeditionary Force, which contains one division-sized ground combat force. In several operations plans and in OIF, the MASS had to field a DASC capable of supporting multiple ground combat elements. This interviewee, and two others, noted that simply reorganizing would not solve a manning or insufficient equipment problem if the battles of the future are going to be fought in the same way.

E. THE FUTURE OF DIRECT AIR SUPPORT: PROCESSES

What almost all of the interviewees did agree on was the critical processes the DASC will need to be able function effectively in the future. Ten out of the twelve indicated that the current Mission Essential Task List would continue to be valid. In addition to those critical functions, some new ones have emerged that were identified as being equally critical.

Interoperability was a common theme, both within the MACCS and with external agencies. For most of the junior officers and enlisted that were interviewed OIF was the first time they interacted with a fully deployed MACCS and with Joint Assets. This lack of previous experience highlighted some of the new processes critical to future air support such as greater interaction with the UAV squadron in conducting immediate requests for aerial reconnaissance, integration with Special Operations, and coordinating real-time information from airborne sensor platforms like the Joint Surveillance Target

Attack System. All three of these new processes elevated a previously rarely used function to become a defining feature of the DASC – Type III Close Air Support (CAS).

Type III CAS is conducted when the terminal controller (usually a qualified Forward Air Controller) cannot visually see the target or the aircraft. Traditionally this was the result of the FAC coming under fire after identifying the target and conditions preventing him from positively identifying the friendly aircraft and confirming that the aircraft is about to drop his ordnance on the correct target instead of the friendly unit. This positive assurance can be waived in Type III CAS when the FAC determines that some other factor will help prevent fratricide. This factor is usually geographical (i.e. a river separates the friendly from the enemy units). During OIF, the DASC found itself using satellite imagery to talk aircraft onto known targets that could not be seen by the FACs. These targets were beyond the range of the forward unit's weapon systems, but posed in imminent threat. Using the intelligence developed by the Division, the DASC was able to task aircraft with these targets. This process was somewhat new to the DASC, but became very important to the Division.

F. THE FUTURE OF DIRECT AIR SUPPORT: SKILLS

Perhaps not surprisingly, all of the interviewees were confident that the function of direct air support is not going to disappear in the future no matter how sophisticated the tactical data systems. One officer summed it up best:

> I don't think the air support function is going anywhere. I believe that as long as there is a Marine on the ground, and an airplane in the sky, there is going to be an interface that has to be provided.

What was unexpected was the resistance found to changing the individual skills required to operate in the DASC. While all of the interviewees acknowledged the role that IT was playing in changing the physical layout and functions of the DASC, less than a third were able to identify any specific changes in training that needed to occur. A senior Marine put it this way, "I don't think it [*IT*] fundamentally changes what they have to do…I think it will support the existing decision-making process, just with more information."

The dominant view was that IT in the DASC should be used as a Decision Support Tool, where the operator still relies primarily on his/her judgment in receiving, coordinating and processing the immediate air support requests. This view is apparently more a result of having little to no confidence in the IT systems that are currently fielded than resistance to change. However, all of the interviewees did express the opinion that training on the existing systems needed to be dramatically improved. They contended that, "the most pressing need is immediately being able to incorporate not only transformational systems…but to really get competent with the use of the systems that we have." In addition, this emphasis on the need for more training on existing systems did not stop at the DASC's tent door:

> Yes it is confidence in the system. Yes, it is 'the system is only as good as the input going into it'. So I wouldn't say it's just an air support problem, certainly not just a MASS problem. I think it's a Marine Corps problem, that we are only taking advantage of 50% of the capability of any system. And that's probably a very high estimate.

The Operational definition that was developed during this research may seem somewhat ambiguous. The DASC may locate with the Division in the future, or not. It probably does not need to redefine its current list of critical tasks, but a few more have been added. Despite adding these tasks there is very little to be done in the way of adding or changing the skill sets of DASC personnel beyond systems proficiency training. This version of the future DASC is thus basically the same as it is today, with the ability to process more information, faster, from just about anywhere on the battlefield. Given this definition what did the DASC's IT infrastructure look like during OIF, and was it sufficient to support a transformed operating environment? The next chapter will explore this topic as it defines the DASC's internal IT domain.

V. DASC IT INFRASTRUCTURE AND PROCESSES DURING OPERATION IRAQI FREEDOM

Initial anecdotal reports from Operation Iraqi Freedom indicated that neither TBMCS nor AFATDS were utilized as planned. Whether it was due to systems interoperability failures or incongruence in fit between the tasks required of the DASC and the technology, or a combination of both, will be explored in this chapter. However, the more critical product of a study of Iraqi Freedom is the analysis of those systems that *were* used and how they enabled the DASC to accomplish its mission. By identifying those aspects of the systems and procedures that worked well in the type of dynamic warfare seen in Iraq, recommendations can be derived for the development of future systems based on a concurrent analysis of the requirements of transformation. This chapter will first decompose the DASC processes into critical data flows internal and external to the DASC. Then, in the Systems Analysis section, a description of the DASC internal IT architecture will be matched to the data flows to identify the weaknesses in the supporting architecture.

A. DASC DATA FLOW

Description of the data flow within the DASC is accomplished using Data Flow Diagrams developed as a result of interviews with the Marines who were in the DASC during Iraqi Freedom. A Context Diagram, called a Level Zero diagram, shows all of the inputs and outputs to the system (Kowal, 1988). In the Context Diagram, squares represent agencies internal to the DASC, circles represent the process being described and arrows identify specific inputs and outputs from the process. A bi-directional arrow indicates a dialogue while unidirectional arrows represent a one-way flow of data. Following the Context Diagram is a Level One diagram, which breaks the system down into a series of functional processes. Level One begins to show how information logically flows through the system. Level Two further decomposes the functional processes to describe how each of them generates the outputs that it does. For purposes

of this paper, the only relevant processes in the DASC will be decomposed to Level 2. The Context Diagram is presented in Figure 9.

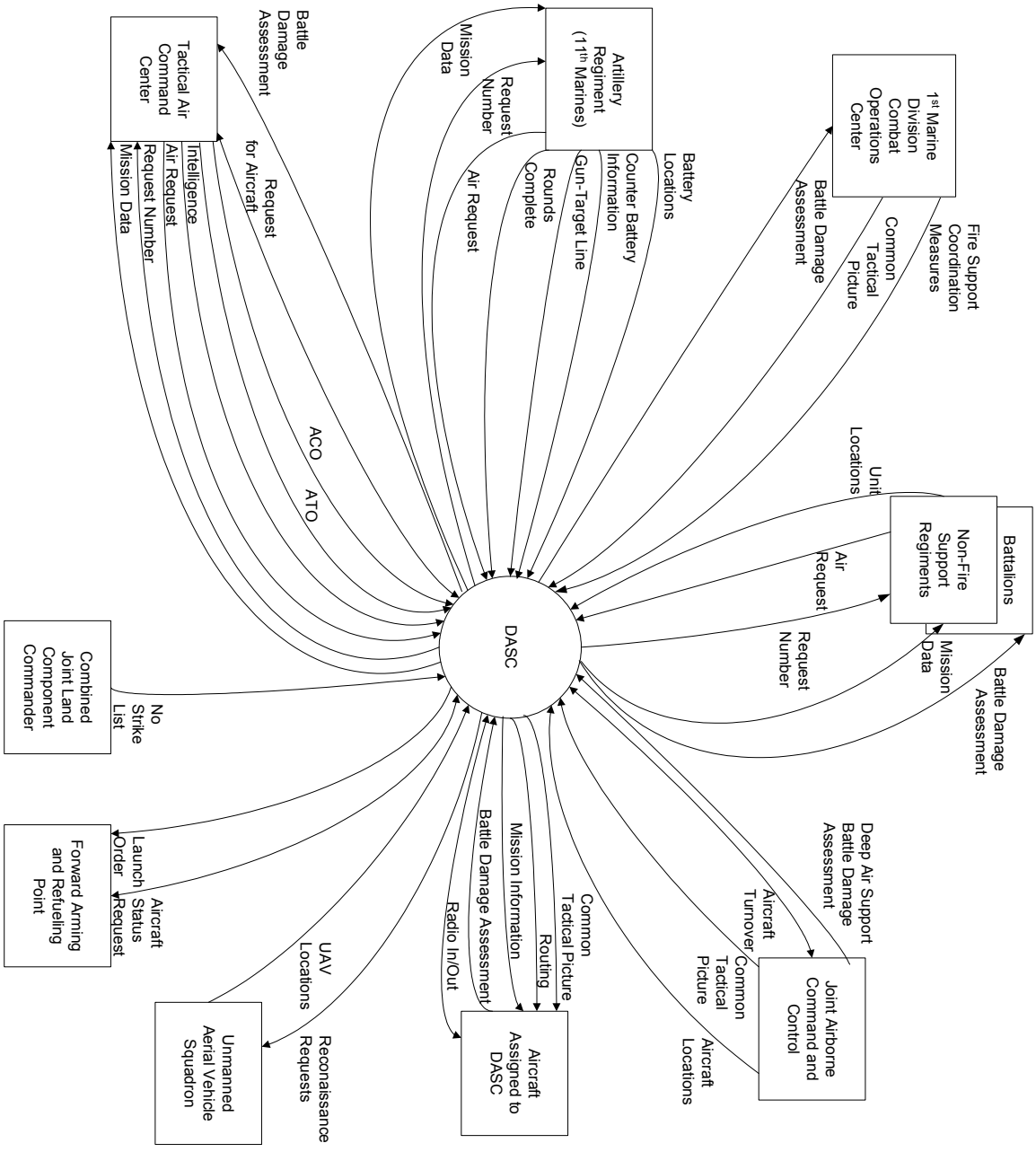

Figure 9. DASC Context Diagram (Level 0)

The intent of this Context Diagram is not to overwhelm the reader, rather to show the incredible complexity involved in the coordination and execution of direct air support. Nor is it needlessly large. In fact, the agencies listed here as external to the DASC, and the information inputs and outputs that connect them, are not the sum total of data flow sources for the DASC. For example, aircraft missions can range from preplanned (missions have been planned and take off at a given time), to preplanned on-call (missions have been planned but are event driven vice time-driven) to immediate (aircraft ready to perform general unplanned missions available either on the ground in alert status or circling over the battlefield). Also, the types of requests can be divided into requests for close air support, medical evacuation, surveillance and reconnaissance, resupply, troop movement or even battlefield illumination. Agencies external to the DASC can also include medical units, electronic warfare units and combat service support units. However, due to the scope of this project, only the primary agencies and critical information items needed for the DASC to perform its mission are shown and explained. Table 1 explains these entities starting clockwise from the top left entity on the diagram.

Agency	Function
1st Marine Division (Ground Combat Element Combat Operations Center and Fire Support Coordination Center)	The DASC controls and directs air support activities affecting the GCE commander's focus on close operations and those air missions requiring integration with the ground combat forces (close air support, assault support, and designated air reconnaissance). The FSCC will make decisions in all cases of conflicting requests for fire support assets. The FSCC provides the DASC with updates to unit boundaries and fire support coordination measures, friendly and enemy unit positions, pertinent intelligence data, and other prearranged data items as they are received at the FSCC. The DASC is responsible to the FSCC to provide timely information on— BDAs, Status of outstanding requests, pertinent intelligence data, delays or cancellations to the ATO, status of ongoing missions and predicted flight paths for aircraft under the DASC's control.
Non-Fire Support Regiments and Battalions	Any unit on the battlefield may request immediate air support from the DASC. Units the DASC is typically in contact with provide the DASC with their current locations and generate immediate air support requests. Requests are assigned a request number by the DASC and approved requests are sent back to the requestor with aircraft mission numbers assigned to them. When a mission is completed any observations regarding battle damage assessment from the pilots is passed back to the requesting unit.

Joint Airborne Command and Control Aircraft	Joint assets exist that conduct a variety of missions involving command and control of the airspace around the Marine's and the control of excess joint air support assets. During OIF, the DASC would request additional aircraft when the ATO did not provide enough form these assets. In addition, radar aircraft, such as JSTARS, were sometimes used to provide positive locations for both enemy and friendly units. Joint aircraft were received from, and then returned to, these assets.
Aircraft Assigned to the DASC	All aircraft assigned to the DASC are required to radio in when they arrive in the DASC's area, and radio out when leaving. Aircrews relay their intentions, radioing the DASC at their designated contact point, respond to the DASC's routing/control, and provide accurate position/location information. The DASC updates aircrew on the most recent changes to enemy and friendly unit positions, threats to the aircrew and their assigned mission. When radioing out close air support aircrews are asked for battle damage assessments.
Unmanned Aerial Vehicle (UAV)	The DASC relies on the UAV squadron to keep it updated on the current location of all UAVs flying in the DASC's airspace. The DASC passes all approved requests for UAV reconnaissance to the squadron and receives reports in return.
Forward Arming and Refueling Point (FARP)	Marines use FARPs to stage both fixed wing and rotary wing aircraft closer to the main battle area to shorten reaction and turnaround time. The DASC relays launch orders to alert aircraft at the FARPS and can verify the locations of aircraft via the FARP.
Combined/Joint Forces Land Component Commander (CJFLCC)	The CJFLCC is ultimately responsible for distributing the information necessary to maintain the location and disposition of friendly and threat ground, air and maritime units within the designated battle space. This data, when compiled and correlated to ensure accuracy forms the Common Tactical Picture and is distributed across the battlefield. Individual units are given permission to update their locations, or their locations are updated automatically via GPS locators.
Tactical Air Command Center (TACC)	The TACC is the DASC's senior agency**.** The TACC authority to the DASC to divert airborne assets to missions with higher priority as coordinated/approved by the senior FSCC and to launch on-call CAS aircraft. This serves to ensure minimum response time to the MAGTF's direct air support requirements. The TACC responds to the DASC's requests to fill the GCE's needs for additional direct air support. The DASC keeps the TACC informed on the progress of direct air support missions, the effectiveness of the OAS effort, and the friendly and enemy air/ground situation. The DASC passes all combat information received from other sources to the TACC.
Artillery Regiment	The DASC maintained a unique relationship with the Marine's artillery regiment during Iraqi Freedom. The regiment provided the DASC with information on gun positions; gun-target lines; and gun trajectories near aircraft flight routes. It also played a major role in generating immediate air requests to prosecute enemy artillery and mortar units found via Counter-Battery Radar.

Table 1. DASC Contextual Diagram Data Dictionary

Now that the major inputs to and outputs from the DASC have been identified, a Level One diagram can be used to define the data flow internal to the DASC. Beginning with the Level One diagram, data stores will begin to appear. According to Kowal a data

store, "is a time-delayed repository of data" (Kowal, 1988). Taken loosely this definition can be applied to a form, or even a database. Table 2 identifies the data stores and their descriptions found in the Level One and Level Two Diagrams. Within the diagrams, a data store is identified by its name with a line above and below it.

Data Store	Description
Automated Deep Operations Coordination System (ADOCS)	Employed as the Combined Joint Forces Land Component Commanders common tactical picture, ADOCS is a situation awareness tool that integrates a broad number and type of C4ISR systems. The DASC primarily used it for its mapping capabilities to determine the location of designated "No Strike" targets in relation to target locations.
Advanced Field Artillery Tactical Data System (AFATDS)	AFATDS provides automated functions including: fire support planning, execution of commander's guidance, fire mission processing, coordination and clearance of fires, submission and receipt of Air Support Requests and Air Tasking Orders, and target intelligence processing.
Airspace Control Order	A document describing all approved airspace control measures covering a 24-hour period.
Air Tasking Order	A document disseminated by the Combined Joint Forces Air Component Commander to components, subordinate units, and command and control agencies which details projected sorties and assigns them to targets and specific missions. The ATO normally provides specific instructions to include call signs, targets, controlling agencies, etc., as well as general instructions for all sorties.
JTAR/ASR/MEDEVAC/JTASR	These represent the four basic types of requests the DASC can process. Each request has its own unique form allowing for ease of readability and use (i.e. the Assault Support Request has blocks for pick-up and drop-off coordinates, while the Joint Tactical Airstrike Request does not). All forms will contain some common items such as time received, mission location, mission numbers, type and number of aircraft assigned, the coordination conducted in support of the request, and the time mission data is sent back to the requesting unit.
Main Map Board	The map board actually consists of three boards, each helping to maintain the DASC crew's situational awareness of the status of the land and air battle. The Map Board is described in detail in the Systems Analysis section of this Chapter.

Table 2. DASC Data Store Dictionary

As shown in Chapter V, the DASC performs many tasks, but they can be divided into four main critical processes as seen in Figure 10 on the next page.

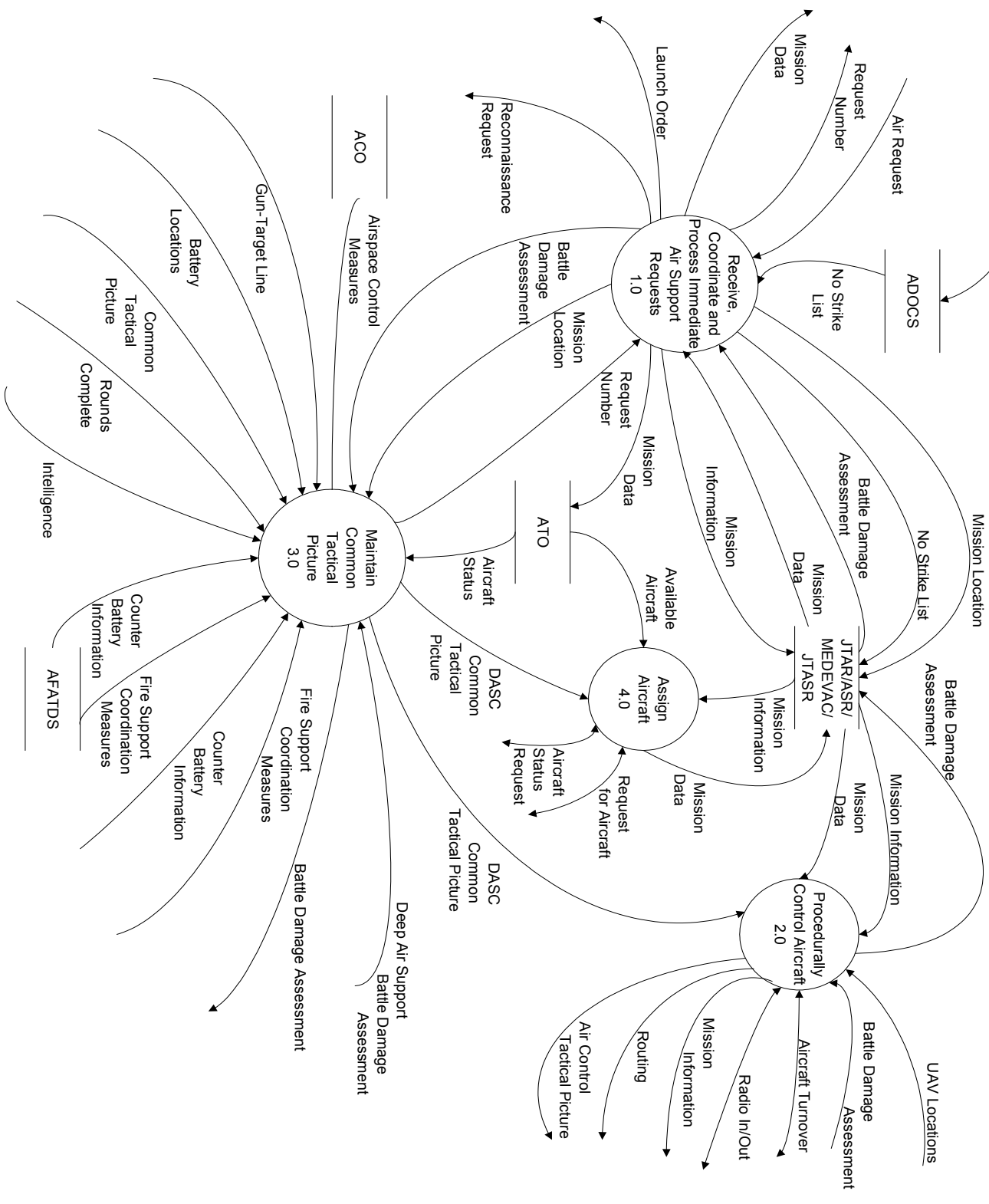

Figure 10. DASC Level One Diagram

The four main critical processes that occur within the DASC and their function are explained in Table 3.

Process	Description
Receive, Coordinate and Process Immediate Air Support Requests	Air Support Net Operators receive requests for air support that are transcribed onto request forms. Request numbers are assigned by the DASC and checked against the common tactical picture for accuracy. The requests are coordinated with external agencies for correct weapons-target pairing or when the request requires external agency approval. The coordinated request then enters the Assign Aircraft process for approval. Approved/Disapproved requests are sent back to the requestor with the mission data of the assigned aircraft on approved requests. Mission Data is also globally updated on the Air Tasking Order. Completed requests contain the results of the mission and that information is used to update the common tactical picture and all relevant external agencies.
Assign Aircraft	Aircraft assignment begins with the reading of mission information from the request form and check of available aircraft for suitability. Insufficient aircraft generates an external request for more. If appropriate assets are found their mission data form the ATO is transcribed onto the request form and sent back to into the Receive, Coordinate and Process Immediate Air Support Requests function.
Maintain Common Tactical Picture	Maintaining the Common Tactical Picture for the DASC is a process of coordinating information that has been both pushed to and pulled from external agencies into a coherent map of the battlefield that includes friendly and enemy unit positions, fire support unit status (firing/nonfiring and their targets) and battlefield geometry. This common tactical picture is used to make decisions in the other three DASC processes.
Procedurally Control Aircraft	Air Support Control Officers control fixed-wing and rotary wing aircraft, UAVs and designated electronic warfare and air reconnaissance aircraft. They coordinate the employment of aircraft with the fire support assets on the battlefield. They brief aircrew on their assigned missions and the portions of the common tactical picture relevant to their assigned missions. They control aircraft by giving them directions to and from a target area based on a series of published procedural control points and the threat to the aircraft.

Table 3. DASC Level One Diagram Data Dictionary

In order to coordinate and process immediate air support requests, assign aircraft and procedurally control those aircraft it is vital that the DASC maintain an accurate, near real time, tactical picture of the battlefield. This tactical picture must have enough detail

that a Helicopter Director can safely maneuver his aircraft around threats and active fire support assets. At the same time, the tactical picture in the DASC must maintain the flexibility for the Tactical Air Director to brief fast moving fixed-wing aircraft on only those pieces relevant to their mission. The tactical picture must be verifiable, unambiguous and readable by everyone in the DASC. It contains the sum total of everything the DASC knows about the current locations of all friendly and enemy units within the DASC's area of responsibility, the current fire support and air control measures, the current immediate air requests that air being processed, and the status of all aircraft assigned to the DASC within a given time window. The Level Two diagram for maintaining the DASC's common tactical picture is shown in Figure 11on the next page.

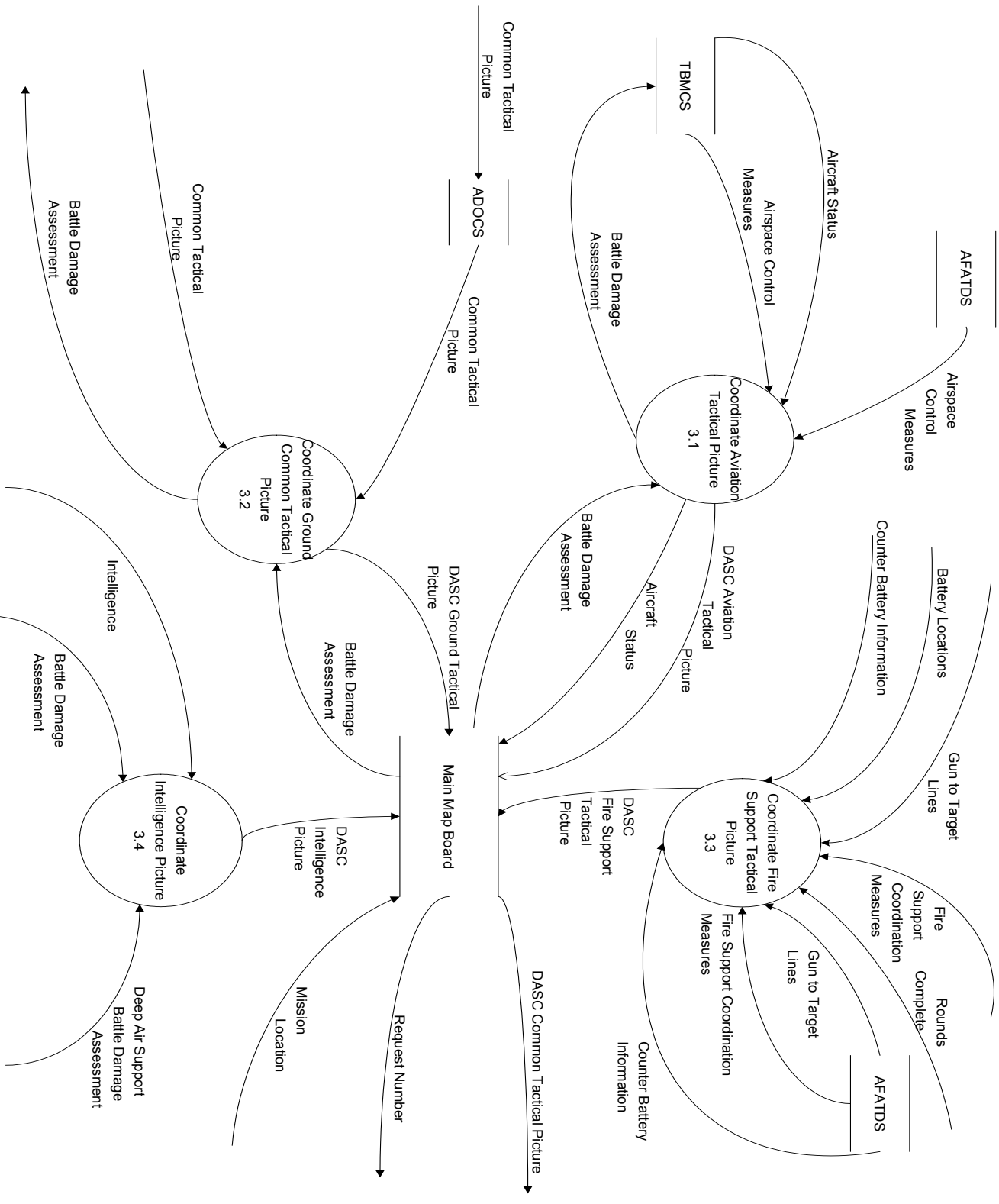

Figure 11. DASC Common Tactical Picture Level Two Diagram

Most of this information is displayed one end of a DASC shelter on a main map board with two "frag" boards to either side. The frag boards display status of the DASC's fixed wing aircraft on one, and rotary-wing aircraft on the other. The main map board contains a topographical map of the DASC's area of responsibility. Icons are used to display the current known positions of all enemy and friendly units and the locations of current requests by type (troop lift, etc). All active fire support and airspace coordination measures (including the procedural control points) are placed on the map via overlays. Current known surface to air threats and their estimated threat range rings are also drawn on the map. As can be seen from the diagram, there are several instances where data flow seems to be duplicated and originates from different locations. This was due entirely to the manner in which the IT architecture was implemented and used during Iraqi Freedom, and is the topic of the next section.

B. SYSTEMS ANALYSIS

Kowal states that, "Before we can propose alternatives to a system that would either alleviate some problem…or provide some desired feature or enhancement, we must clearly understand the existing problem" (1988). In order to do this Kowal suggests that the physical model created above can be logically analyzed in terms of inputs and outputs to identify any weaknesses or redundancies in the system. By taking a look back at the Level Two diagram these redundancies begin to become apparent.

As described in Table 2, the DASC has a number of tactical data systems that are designed to provide it with a common tactical picture similar to the one displayed on the main map board. In fact, the DASC has experimented with using projection screens with projectors to display the common tactical picture in place of the current map board. However, another look at the Level Two diagram will show the same data flow coming from these systems is being duplicated and coordinated prior to becoming a 'DASC Tactical Picture.' For example, inputs to process 3.4, Coordinate Fire Support Tactical Picture, include Fire Support Coordination Measures generated within the system from

AFATDS and external to the system (from 1st Marine Division on the Contextual Diagram). The reason for this duplication, as one Marine put it:

> [*We*] would receive up to 40 geometries every 5 minutes, we would have to figure out which ones would relate to our AOR [*Area of Responsibility]*, most of the time we would have the Division ASLT [*Air Support Liaison* Team, DASC personnel assigned to the 1st Marine Division Fire Support Coordination Center as liaisons] ask the FSCC what FSCMs are important then the ASLT would tell me, I would pull them up and write down the grids and much of the time the grids wouldn't match between AFATDS and what the ASLT could get for us.

When asked what the DASC would do when it found the grid coordinates for fire support coordination measures received from AFATDS did not match those provided by the ASLT, the operator replied, "After a couple of times we stopped using the AFATDS FSCMs except as a last resort. When we would go get our friendly updates we would get the FSCM changes as well." The operator's mention of getting friendly updates additionally refers to relying on the ASLT to provide the ground common tactical picture vice relying on the common tactical picture provided by ADOCS or TBMCS.

The question becomes, where is the disconnect between tactical data system capability and its actual use coming from? A senior officer described the situation in the DASC today:

> And again that becomes a friction point, taking an existing level of personnel and training level in the operating forces, what I have on hand today, and bring in any system, the greatest system in the world, without adequate training, without an adequate understanding of its transformational purpose, and without the acceptance of it as a transformational tool…Lay it into the existing organization that we have today and we will invariably throw out the baby with the bathwater.

In every instance on the Level Two diagram where a data flow is duplicated the DASC found itself coordinating incongruencies between two or more methods of receiving the same data. The reason behind relying on the ASLTs (located throughout the battlefield at regiment-sized units and above) was the perception of the DASC that they could not rely on the tactical data systems to provide them accurate information. As one senior officer commented:

> We still have systems, not the greatest systems in the world, we have systems that are feeding us information, whether you're talking C2PC, or

> ADOCS, or Blue Force Tracker, we have any number providers or sources of information, but no trust or confidence in any one of them to be the total answer.

So, the DASC reacted to the inability of the tactical data systems to generate an accurate common tactical picture by coordinating their own 'DASC Common Tactical Picture' that it would use in support of the other three major internal processes. All information entering the system was checked against other information for correlation before being placed onto the main map board.

However, not blaming the systems for the inaccuracy or unsuitability of information input to the DASC was a common theme found in the interviews. In fact, all but one of the interviewees agreed that the problem was not necessarily the systems themselves, but the level of training on them across the entire Marine Corps. The same senior officer said:

> We take a system that is designed in somewhat of a conceptual, forward-leaning state, and we throw it into existing organizations and processes without adequate training, without an understanding of exactly what it's supposed to do and almost use the system to force reorganization. I think the most pressing need is immediately being able to incorporate not only transformational systems, although many of the automated systems we have today are somewhat transformational in their own nature, but to really get competent with the use of the systems that we have.

And this perception exists not only at the management level, but with the operators as well. An enlisted instructor of one of the systems noted that the level of training required to make the systems useful to the DASC was not being conducted:

> Like right now, since we've been back I haven't heard one person talk about going to go train on TBMCS. Yet we have half a dozen brand new PFCs [*Privates First Class*, a junior Marine with less than 9 months in the Marine Corps] here. I haven't heard one person say a word about it. We may have a handful of Corporals and Sergeants that can do it, but they're not going to be around forever. In fact, you see a lot of them heading out the door. And, it has to be a continuous process; the sustainment training just isn't there for those systems. They're constantly being modified, and if you don't keep that up, it's obviously something that's perishable. Especially even those that do have the skills still have to sustain their training and it doesn't happen; with any of those systems.

Despite the caveats provided by the DASC personnel regarding training throughout the Marine Corps, "I wouldn't say it's just an air support problem, certainly

not just a MASS problem. I think it's a Marine Corps problem, that we are only taking advantage of 50% of the capability of any system. And that's probably a very high estimate," there does seem to be recognition of interoperability problems within the DASC's internal IT architecture. One example is the noted deficiency in regards to gun to target lines (GTLs).

GTLs involve the drawing of a line from a fire support unit to a target it is currently firing on. The GTL includes a time or duration of firing and the expected maximum altitude the ordnance will reach in its trajectory. Knowing the real-time location of GTLs is important for the Air Support Control Officers to know when routing aircraft through the area. AFATDS is capable of generating GTLs that the DASC can use, but only if all of the AFATDS terminals from the firing battery through its battalion, regiment and the Division are set up correctly. This requires training several dozen Marines, who do not work for the DASC, on how to set up their terminals to best benefit the DASC. In addition, the GTLs generated by AFATDS are internal to the AFATDS software and cannot be exported to other systems. Since AFATDS is not meant to be a displayer of the Common Tactical Picture it often has a highly inaccurate picture of the current situation displayed on its map, therefore the GTLs (when they are displayed) become useless.

The relative lack of quality training, combined with systems that have not reached their incremental interoperability objectives, posed a conundrum for the DASC during Iraqi Freedom.

> Whatever the source of the information, whatever the system that inputs the information…to then transmit [*the information*] via C2PC, or via ADOCS, or via any other system…I don't really see that as where we need to be in order to have the confidence in the picture as it's being displayed...The incorporation of that automated input into our decision making process, we're not doing that very well. We didn't do it very well during OIF and until something that really proves itself comes along, I don't see us getting much better at it.

Whether the apparent disconnect between user needs and IT capabilities is at a critical level, depends on who you are, and where you sit with respect to the DASC. Now that all

four domains of the Strategic Alignment Model have been described in terms of the DASC, the next chapter examines the perspectives on alignment found within the sample of interviewees.

VI. ANALYSIS OF THE DASC STRATEGIC ALIGNMENT MODEL

The interviews conducted in support of this portion of the research included four senior officers (major and above) and two senior enlisted (gunnery sergeant and above) with a combined total of over 100 years in the Marine Corps. Their current billets placed half of them working directly within the DASC during Iraqi Freedom and the other half external to the DASC but still within the MACCS. These six Marines were asked questions related to their perception of the strategic alignment of the DASC.

After explaining the domains of the Strategic Alignment Model and how it relates to the MACCS and DASC, the interviewees were asked a series of questions about the relative strengths of the domains. First, they were asked which domain was the weakest, or in most critical need of change. Once that domain was identified, they were then asked which of the remaining domains was the strongest, or would drive the changes needed in the weakest domain. Finally, they were asked which of the two remaining domains would be most affected by making a change in the weakest domain.

By following this method, the author was able to code the interviews by identifying the Domain Anchor (strongest), Domain Pivot (weakest), and the Impact Domain (most affected) and analyze the perceptions defined by Henderson and Venkatraman, and Papp and Luftman, which resulted from their responses. These perspectives are presented along with their anticipated impact on the DASC. The final chapter will analyze the enablers and inhibitors to achieving strategic alignment found in the DASC and its impact on future development.

A. PERSPECTIVES AND THEIR MEANINGS

Among the six interviews, 50% identified the Competitive Potential perspective as their view towards achieving alignment in the DASC. Two of the remaining three interviewees identified the Organizational Infrastructure perspective and one identified the Technology Transformation perspective. The relative frequency with which a perspective was found should not be taken as an indication of central tendency, or the

'right' perspective. It is entirely possible that multiple perspectives are necessary to obtain a complete, accurate and effective view of an implementation. Moreover, even if one wanted to obtain a measure of central tendency in perspectives, the sample of interviewees was too small to draw any statistical inferences. Hence, each perspective will be given equal consideration in its meaning for the DASC.

1. Competitive Potential

Competitive potential involves the recognition by an organization that its strength lies in its technological superiority in some facet. Using this superiority to its advantage the organization adjusts its business model to take full advantage of the edge given by its technology, which affects the way it conducts business on a day-to-day basis. From this perspective, new or emerging technology is used to define what an organization is to become and then decide how to utilize that technology.

The interviewees who identified with this perspective indicated that the MACCS business strategy was the weakest domain. Despite the publication of the MACCS Concept Papers, the common perception was that actual change had yet to occur. The emphasis was placed on not just defining, but also actually repositioning the MACCS business strategy because:

> What's more important to me…and probably what's more important to the Marine Corps as an institution is the external function. Because, the internal has pretty specific, although important, functions. But in totality, with one being subordinate to the other, I think that it's more important to have your MACCS and your external [*IT*] functions lined up first.

The driver of change to the MACCS strategy was seen as the available technology and how to employ it. Allowing IT Strategy to drive business strategy was not seen as reactionary by the interviewees. In fact, they felt that the MACCS could be proactive. "What we should be doing is having a little more foresight to say, 'this is what's coming down the road,' and jumping ahead and starting to reorganize to take on the technology as it comes in and be ready for it."

The result of a refined business strategy that takes advantage of emerging technology is a change in the internal processes that execute the business strategy. In

terms of the MACCS, this means that tomorrow's direct air support function may or may not look anything like today's DASC.

> I think the biggest change will happen in the air support function side. All those functions that we group today in one facility, in one center, are going to become distributed, and regrouped with other functions from other agencies as driven by operational requirements. So they'll be different every time. On one operation or exercise you may get a grouping that's laid out on the battlefield a certain way, because of the mission requirements that are there. And then the next thing that you go to could be completely different.

While this may not be what the DASC will look like, once the MACCS allows itself to adapt to employ IT to its best advantage, then it can study how much business process reengineering needs to occur to support the new strategy.

2. Technology Transformation

This perspective tries to optimize the internal IT infrastructure by changing the IT strategy to better align with the overall business strategy. It is pursued by organizations that have identified an IT strategy through the development of their business strategy. This IT strategy is then used to design and create a system that supports it. Thus the business strategy, which identifies areas in which an organization plans to excel, defines the IT strategy to support those areas, leading to the design of an IT infrastructure that supports the business strategy.

Although not identified specifically by more than one interviewee as the weakest area, three out of the six did note a deficiency in the IT Strategy domain. Comments in this area focused on the perceived lack of an overall IT strategy:

> What is lacking is…we have a whole lot of systems out there…we have AFATDS, we have ADOCS, we have TBMCS, we have C2PC, you know, the list goes on and on. In the TACC center they have at least 4 more. What is lacking, and I think what has been lacking, is an information management plan, as to what information goes over what system, and how, and to who, and more importantly, why. There's a danger, I think, and I've seen it, in too much information available.

The Technology Transformation Perspective sees the role of the IT manager as an enabler of a strong business strategy. "I think that the Concept of Employment should always drive the material solution, be it IT or hardware or facilities or whatever." In this case, the drivers of change are the top managers within the MACCS. In order to

effectively enable the IT strategy, these managers must understand the relative strengths and weaknesses of their current architecture. They also need to be able to articulate to the IT manager how technology should be applied (i.e. for automation of direct air support requests).

Once the IT strategy has been revised to best support the Business strategy, the impacted domain is the Internal IT Infrastructure. The internal IT infrastructure undergoes its own reorganization as decisions to purchase new systems and continue to employ legacy systems become aligned with the Business and IT strategies.

> It should drive some of the change in the internal architecture, but it should not drive a change in processes and skills. There might be some processes that can be streamlined because of IT that meets our needs better than it does now. Maybe "X" process in the air support function can be streamlined because the IT available in the years to come is better, more user friendly, more dynamic than what I think it is right now.

3. Organizational Infrastructure

The organizational infrastructure strategy occurs when the results of a business reengineering process are used to define the corporate strategy, which leads to the adoption of a new IT strategy. The two interviewees who identified with the Organizational Infrastructure perspective felt strongly that change had to be driven internally from within the functions of the MACCS:

> I think the most effective change is going to be driven from below, because it just seems to be…we got an elephant we have to eat. If we're going to transform the MACCS and transform the Marine Corps, we've got to eat it all, and we've got to eat it in bite-sized chunks. I believe those are better addressed at the functional level from both the IT perspective as well as the process and organization perspective. And then the end result of that low level transformation becomes a transformation of the entity.

The Organizational Infrastructure perspective relies on first determining what are a businesses core functions and processes, and then adapting the external business strategy to maximize the leverage provided by those critical functions. Functions like direct air support should be solidly defined and then used to guide the MACCS Business strategy. The two interviewees who identified with this perspective saw the internal functions driving this change in strategy, "because we've got to get from where we are

today, to where you can match different functions throughout the MACCS to form nodes, and those sorts of things, that better support the mission and the capabilities of the technology that is there."

As with the Technology Transformation perspective, the interviewees who identified with the Organizational Infrastructure see the existence of a strong MACCS Business strategy as having an immediate effect on the MACCS IT strategy. However, in this perspective the MACCS Business strategy is considered the weakest domain, with a change making an impact on the overall IT strategy. Until the MACCS redefines itself, the IT strategy cannot progress. "It's kind of hard to transform how you would like to do things, or how you want to do things, when you're continually tied back to how you have to do things today."

B. THE IMPACT OF MULTIPLE PERSPECTIVES

The existence of multiple perspectives among the senior leadership may seem to cause problems as the MACCS and DASC are redefined (or not) in accordance with the Transformation objectives. The goal of the Strategic Alignment Model is to allow executives to select the perspective that best reflects their "business conditions and organizational objectives" (Henderson & Venkatraman, 1993). The selection of a perspective often depends on where you sit in relation to the four domains. For example, if the interviewee's job was to develop the MACCS IT strategy, the model predicts (s)he would probably take the Competitive Potential perspective and would see IT strategy as driving the Business strategy to redefine the Organizational infrastructure.

The multiple perspectives, then, only indicate that the leadership is viewing the lack of alignment from different frames of reference. Each of the interviewees was distinct in their roles by virtue of different ranks or holding different billets within the MACCS and DASC. These different perspectives help to keep the senior leadership from becoming too focused on one type of alignment and neglecting the overall process.

In fact, Henderson and Venkatraman indicate that the only way to strengthen a diagonal link in the model is for senior management to fully understand the two

perspectives that create change in the Impacted Domain from the Anchor Domain. This would require a change in two Pivot Domains, which can only be accomplished by the senior leadership responsible for those domains. To truly create alignment between business and IT strategy in the DASC will require an acknowledgement on the part of the MACCS senior leadership that these different perspectives exist, and an understanding of how to leverage those perspectives to achieve alignment. This will be the topic of the final chapter.

VII. ACHIEVING STRATEGIC ALIGNMENT IN THE DASC

The basic premise of strategic alignment is that there should be a balance among the four domains. There should be a strategic integration between external business strategy and IT strategy, as well as an operational integration between the organizational infrastructure and the supporting IT architecture. And, of course, there must a functional integration between the external business strategy and internal organization, and the IT strategy and IT infrastructure. A lack of congruence in fit between the strategic, operational and functional integration exposes an organization to a higher level of business risk (risk of failure).

On the battlefield, as in the business world, a certain level of risk must be accepted. However, risk that can be mitigated without loss of operational effectiveness should be reduced after careful consideration of the costs and benefits. In this perspective, the mitigation of risks becomes removal of the barriers to strategic alignment. This can be accomplished by maximizing alignment enablers and minimizing inhibitors as Luftman and Brier suggest (1999). In an extension of the 1992-1994 study that produced the additional four perspectives detailed in Chapter II, Luftman and Brier surveyed 500+ firms at IBM's Advanced Business Institute. The results of this survey identified 12 enablers and inhibitors to alignment as shown in Table 4.

ENABLERS	INHIBITORS
Senior Executive Support for IT	IT/Business Lack Close Relationships
IT Involved in Strategy Development	IT Does Not Prioritize Well
IT Understands the Business	IT Fails to Meet its Commitments
Business/IT Partnership	IT Does not Understand Business
Well Prioritized IT Projects	Senior Executives Do Not Support IT
IT Demonstrates Leadership	IT Management Lacks Leadership

Table 4. Enablers and Inhibitors to Strategic Alignment (After: Luftman & Brier, 1999)

During the research interviews for this case the interviewees were also asked what they thought were the enablers and inhibitors to alignment in the DASC. This final chapter will outline the inhibitors and enablers identified in the interviews (highlighted in Table 4) and map them to the ones identified by Luftman and Brier. This paper will conclude with recommendations for mitigating the effects of the inhibitors and strengthening the enablers to strategic alignment in the DASC.

A. INHIBITORS TO ALIGNMENT IN THE DASC

When asked the question, "What things do you think hamper the relationship between the development of doctrine and tactics, techniques and procedures and the design and implementation of data systems," five out of seven interviewees identified a lack of training on systems after they were fielded. Four of the respondents were the same senior Marines who provided their perceptions on alignment in the last chapter. This is interesting because the lack of training on fielded systems unfortunately highlights the inhibitor involving a Lack of Senior Executive Support for IT.

As discussed in Chapter V, nearly all of the interviewees felt the current tactical data systems were adequate, but that training across the Marine Corps in their implementation and use was inadequate. However, the impetus for training Marines falls directly on the shoulders of their leaders. Granted, there are valid reasons why adequate training cannot always occur. An example would be the fielding of ADOCS only a few months prior to its use in the field. The most common reason identified for the lack of training was that the operational tempo within the DASC precluded sending more than a few Marines at a time to schools for instruction. On top of that, the schools that are available rarely focus on the specific needs of integrating the systems within the DASC into an automated direct air support tool. In fact, there currently are no schools that provide this level of training. So the DASC has found itself with, "a handful of Corporals and Sergeants that can do it, but they're not going to be around forever."

The other major inhibitor identified in the interviews was the perceived weak relationship between the IT designers and implementers and the operating forces. This lack of a close IT/Business Relationship is varyingly attributed to both sides of the

relationship. Some felt that, "the Fleet is very busy, and the same folks that you need to talk to, the folks that are developing, acquiring and planning these systems, the people that they need to talk to are the folks that are in the field for several months out of the year. And it's just hard to get a hold of them." Others felt that the problem was one of functional integration, "So, we're always at odds. You have the vision, if you will, being bantered in and around the beltway…And then you have the realities of what's in the unit, what's in the Fleet today, and it's a tough marriage to get those two together."

The Department of Defense Instruction (*DoD 5000.1 The Defense Acquisition System*) addresses this issue by stating a preference for spiral development in the acquisition process. Spiral development is a process for developing a set of capabilities identified by the users within one increment. The system being developed undergoes one or more planned increments, leading to a final product. This requires interaction between the user, tester, and developer, providing the user with the best possible capability within the increment. However, as this perspective demonstrates, user has been constrained by operational tempo. In fact, no matter the perspective taken, the four interviewees who identified the lack of a close working relationship between Business and IT, pointed out that operational tempo was a major factor.

B. ENABLERS

One of the primary enablers identified during the interviews was that the IT developers and strategists within the Marine Corps tend to understand the business very well. "From the perspective of inputs into the systems themselves, the systems specifications documents, the threshold requirements, the things that the systems themselves want to accomplish. I believe that the alignment there is probably pretty tight." This is not an indication of IT designers understanding the tasks and functions of the DASC, or vice versa. Rather, it is the enabling factor created when someone with business experience is placed internal to the development process to help translate user requirements. This strength of alignment comes from the Marine Corps' policy of placing Marines with a significant amount of fleet experience into the program offices. What the interviews indicated was that when fleet input was sought, recorded, and later

verified in the IT development process, it helped greatly that the IT team had a DASC or MACCS member who could translate the requirements for the fleet. However, as noted in the Inhibitors section, often the fleet Marines felt their input is not felt in the process, either because they were not asked, or were unable to spare the experienced Marines long enough to provide meaningful input.

Further, some interviewees identified that even with DASC or MACCS personnel directly involved in the acquisition process, the results are not always ideal. "They [*program offices*] solicit those opinions from the fleet, but some of them might be too senior or they're in positions where they don't find themselves sitting in a tactical agency often enough during exercises to really know what the Marines face on a day-to-day basis while they're out in the field. And how they have to do things." While it is seen as an enabler to have program managers and combat developers who have had specific training or experience in the career field of they are they are responsible for, the skills they have are seen as perishable. The longer a Marine has been away from his primary specialty, the less able they are to accurately identify and translate the requirements in that community.

C. RECOMMENDATIONS

Operational tempo was seen as the root cause of almost all of the inhibitors found during the interviews. High operational tempo results in a lack of time and qualified personnel available for future systems development. This leads to an inability to: produce validated requirements, verify that the requirements match fielded systems, develop an integrated concept of employment for new systems, and train on those systems. However, when there is a pause in the operational tempo, experience brought by qualified DASC or MACCS personnel to the acquisition process can be invaluable. This is especially true when the combat developers have experience in the DASC or MACCS and can act as mediators between the users, designers and program mangers.

So where does the middle ground lie? How do we mitigate the effects of increasing operational tempo, and simultaneously enable the acquisition community, to strengthen the DASC's strategic alignment? The answer may be to create an entity that

can bridge the gap between user needs and fielded technology. This entity already exists in the Transition Task Force (TTF), a group of senior MACCS officers and enlisted headed by the commanding officer of Marine Air Control Group 38. However, as noted in Chapter III, the purpose of the TTF is not to develop technology, but to "recommend doctrinal and organizational changes" to the MACCS (Hough, 2003), therefore significant changes would need to be made to the TTF in order to sanction it to perform this expanded role.

First, while the recommendation of doctrinal and organizational changes should be a part of the TTF's mission, this may not be the sum total of what it should be doing. Our results suggest that an organization like the TTF needs to take a broader role in the overall structure of the Strategic Alignment Model. It should provide the linkages found in the center of the Strategic Alignment Model, ensuring that the enablers to alignment are identified and strengthened. For example, it should be responsible for identifying the specific needs of the DASC in regards to the effective employment of AFATDS. These needs can then be translated into requirements at the MACCS level when combined with the needs of any other agencies. This would have the effect of strengthening the MACCS' IT Strategy. By focusing on the linkages of the model, the TTF would be able to affect all domains nearly simultaneously. Its correct positioning, then, is not within the Business Strategy domain, but as an agent for change external to the model.

As shown in this study, strategic alignment requires balancing the external and internal business and IT functions. Therefore, in order for an organization such as the TTF to be effective in aligning strategy with IT functions, it must have three things in addition to the ability to define the MACCS' business strategy: 1) the ability to describe and analyze the systems in the MACCS in a manner similar to the system's analysis performed in this study, 2) a way of collecting, reviewing and validating the internal organization, procedures and user requirements of the MACCS functions separately from the existing MACCS agencies, and 3) the authority to influence the Marine Corps' IT strategy, particularly in regards to the MACCS.

The TTF is already capable of accomplishing these four tasks to some extent, however it lacks the training to conduct the operations and systems analysis required as

well is the authority to influence the direction of IT. To affect these changes it is recommended that the membership of the TTF be expanded to include not just operational units, but also elements from Marine Corps Systems Command, Marine Corps Operational Test & Evaluation Activity and the Marine Corps Combat Development Command. This organizational structure would give the TTF the expertise, authority and direct link to the user required to ensure alignment.

D. CONCLUSION

The need for strategic alignment between business and IT strategy is clear. Without it, the competitive advantage that innovative technology can bring to the battlefield can be damaging at worst (through misapplication) or underutilized at a minimum (as seen in Operation Iraqi Freedom). As seen here, there is a perception of misalignment in the current acquisition process that fails to take full advantage of transformation doctrine and emerging technology.

By aligning both the external and internal strategies and functions of the DASC, a synergy can be created providing better situational awareness and responsiveness on their part. This would lead to the more efficient application of available IT resources and improved processes for receiving and processing immediate air support requests. One way to improve the internal architecture and transform existing organizational infrastructure and processes is to look at it from the strategic alignment perspective.

However, being able to take any process, procedure or function, and break it down via systems analysis to its functional primitives and analyze them for process improvements through the introduction or development of supporting IT systems is a costly and time consuming process. Further study would be needed to determine the costs and benefits related to improving strategic alignment within the DASC. It may be found that alignment must first occur at a higher level, between the MACCS and the Marine Air Ground Task Force, before the issues of the direct air support function can be addressed.

The expansion of the Transition Task Force's membership and authority would obviously have a far greater impact than on just the DASC. It would be a new way of matching requirements to fielded capabilities within the MACCS. Further, it has larger implications for the Marine Corps as a whole; those also would need to be the subject of further study. Finally, it should be noted that strategic alignment, like the DoD's Transformation, is not a finite process with a specific end goal. Strategic alignment requires continuous reevaluation of the fit between the four domains, identifying the current weakest area and the domain to be used to drive a change. Once balance has been restored, the process begins again, continually looking for the edge on the battlefield that alignment brings.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A - INTERNAL DASC ORGANIZATION (MCWP 3-25.5)

DASC Officer in Charge (OIC)

The DASC OIC is a commissioned officer not normally assigned to a crew as a watchstander. The DASC OIC is designated by the Marine air support squadron (MASS) commanding officer for a specific operation and is responsible for—

Embarkation and logistics

Overall conduct of DASC operations

Configuration of DASC communications

Coordinating with joint, multinational, and other external agencies as required

Evaluating and supervising training for the DASC crew

DASC Staff Noncommissioned Officer in Charge (SNCOIC)

The DASC SNCOIC is not normally assigned to a crew as a watchstander. The DASC SNCOIC responsibilities include—

Assisting the DASC OIC as required

Coordinating the DASC's embarkation and logistics

Evaluating and supervising training for enlisted crew members

Accountability of all personnel assigned to the detachment

Senior Watch Officer (SWO)

The SWO is normally a senior officer who is not assigned as a crewmember, but who is responsible to the commanding officer for—

Assisting in coordination with joint, multinational, and other external agencies

Assisting the senior air director (SAD) by providing briefings to visitors and coordinating the efforts of the DASC.

Evaluating and supervising hands-on training for the DASC crew

Senior Air Director (SAD)

The SAD is the commissioned officer who is the most qualified DASC watchstander. The SAD is responsible for—

Overall functioning of the DASC crew on watch

Ensuring intelligence information received by the DASC is disseminated to appropriate air control, air defense, and supporting arms elements

Receiving, disseminating, and posting all fire support information in the DASC

Coordinating with fire support agencies to ensure deconfliction between aircraft and supporting arms is accomplished

Coordinating the efforts of DASC liaison teams and airborne extensions of the DASC as required

Coordinating with agencies external to DASC

Directing DASC communications restoration priorities and the upkeep of the DASC's overall communication status

Maintaining a log of significant events that occur during the crew's watch

Ensuring the logs of the tactical air director (TAD) and helicopter director (HD) are complete, reviewed for clarity, and properly signed in and out

Assigning Appropriate A/C to Immediate Air Support Requests

Crew Chief

The DASC crew chief, normally a staff noncommissioned officer (SNCO) or noncommissioned officer (NCO) and the most qualified enlisted watchstander, is responsible to the SAD for—

Timely and accurate display of all tactical information

Coordinating communications restoration and the upkeep of communications status

Maintaining a log of significant events that occur during the crew watch and files containing required forms and records

Ensuring the net operators' logbooks are completed, checked for clarity, and properly signed in and out

Coordinating DASC-internal information flow

Supervising the enlisted members of the crew

Tactical Air Director (TAD)

The TAD is responsible to the SAD for—

Coordinating and controlling fixed-wing offensive air support (OAS) aircraft, unmanned aerial vehicles (UAVs), and designated assault support, electronic warfare (EW), and air reconnaissance aircraft

Coordinating direct air support missions with fire support assets (naval surface fire support, artillery, etc.)

Briefing aircrew on assigned missions, threat information, and fire support coordination measures

Reviewing requests for fixed-wing aircraft and recommending the most efficient use of available assets

Maintaining status information on all fixed-wing aircraft under the control of the DASC or terminal air controllers

Coordinating with the HD to eliminate scheduling or mission assignment conflicts between those missions that involve both fixed- and rotary-wing assets or when more than one mission is conducted in the same area

Advising and directing fixed-wing aircraft as to changes in the air defense warning condition and weapons control status

Maintaining a log and records as appropriate

Helicopter Director (HD)

The HD is responsible to the SAD for—

Coordinating and controlling helicopters

Coordinating designated rotary-wing missions with fire support assets

Briefing aircrew on assigned missions, threat information, and fire support coordination measures

Reviewing requests for helicopters and recommending the most efficient use of available rotary-wing assets

Maintaining status information on all helicopters under control of the DASC or terminal controllers

Coordinating with the TAD to eliminate conflicts between fixed-wing missions and helicopter missions

Coordinating with the assault support coordinator (airborne) (ASC[A]) for control of assigned aircraft

Advising aircrew of the current air defense warning condition and weapons control status and directing helicopter actions specific to the particular air defense alert condition

Coordinating with the TAD on helicopter missions conducting close air support (CAS)

Maintaining a log and appropriate records

Air Support Net Operators

Air support net operators are usually enlisted personnel who operate the various radio nets within the DASC. They normally include the tactical air request/helicopter request net operator, the direct air support net operator, the tactical air traffic control net operator (when required), and the tactical air command net operator. Some net operator functions may be combined depending on the DASC's task organization. Air support net

operators are specially trained in air control procedures and terminology. An air support net operator's responsibilities include—

Knowing net names, frequencies, and types of communications equipment being used

Knowing the call sign, name, and unit location for stations operating on their assigned communications net(s)

Knowing the type of information expected to be transmitted and received on the net

Understanding the forms/records required to record information from or pass information on the net

Understanding the air/ground situation, to include boundaries, control points, and control measures necessary to effectively operate and understand information passed on the net

Managing net operations if assigned as a net control station

Maintaining a log of significant events that occur during the watch

Understanding and executing the correct info flow within the DASC

Air Support Plotters

Air support plotters are normally enlisted personnel who, under the supervision of the DASC SAD and crew chief, maintain the situation displays within the DASC. They are specially trained in air control procedures, terminology, and symbology. Air support plotters are responsible for—

Plotting information directed by DASC supervisory personnel

Receiving, recording, and disseminating information received over the appropriate net(s)

Communications-Electronics (C-E) Maintenance Coordinator

The C-E maintenance coordinator is assigned to the crew to monitor communications nets, monitor the status of the DASC's cryptographic instruments, and provide liaison with other C-E Marines operating associated C-E equipment.

APPENDIX B - FIELD RESEARCH INTERVIEW SCHEDULE

Purpose: The purpose of this interview is to determine your opinions on how technology does and should support the MACCS and DASC envisioned in the Marine Corps' Transformation concepts. I will be using your answers to determine what perspective towards Expeditionary Maneuver Warfare's MACCS Concept of Operations and the internal organization of the future DASC. Your answers will also help me to identify your views on the development and implementation of C4ISR systems in the MACCS and for the direct air support function. This research will be used to identify a pattern, which when applied to a Strategic Alignment Model, can be used to help leverage fleet buy-in on the future of air support and C4ISR. *(At this point, show them the SAM, but not the expected perspectives)*

Agenda: I will be asking questions about how you view the current state of MACCS IT and Employment strategies as well as how the DASC is organized and equipped to perform the air support aspect of the Control of Aircraft and Missiles Function.

Expected Nature of Responses: This is not a multiple-choice test. There is no right answer. I am looking for your opinions and perspectives on these topics in as much detail as you care to provide. As I ask these questions, if you can think of any specific incidents or details of your experiences that will help emphasize your answers, they would help a great deal in the case study.

Extent of Informality and Probing Nature of Follow-up Questions: While I will be asking some specific questions to ensure certain areas of the Strategic Alignment Model are covered, I may ask follow-up questions based on your responses to get more details.

Debriefing: On Friday I will conduct an exit interview at _____ if you are interested in attending. During the debriefing, I will be happy to answer any questions about the Strategic Alignment Model and how it will be applied in my research.

Notes and Tape Recording: If it is okay with you, I would like to tape record this interview and make some notes during your replies. This will help me better analyze your responses in relation to the model. Your privacy is guaranteed. Though I will ask some basic questions about your relative position and experience, nothing you say in this interview is attributable without your express consent. If, during analysis, I decide something you have said would lose its meaning without an attribution I will contact you directly for permission to quote you.

Pre-existing Questions:

Background:

1. Please state your rank and name.
2. Briefly describe your career in terms of duty stations and billets
3. What role did you have during Operation Iraqi Freedom?
4. Have you held any billets involved with the development of Marine Corps transformation doctrine?
5. Are you familiar with the MACCS Concept papers "MACCS and OMFTS" and "MACCS and EMW"? *(show the two books)*
6. How would you rate the strength of the relationship between the transformation vision and the development of tactical data systems for the MACCS/DASC?
7. What things do you think need to happen to enable a stronger relationship between the development of doctrine and TTPs and the design and implementation of data systems?
8. What things do you think hamper the relationship between the development of doctrine and TTPs and the design and implementation of data systems?
9. Which of the following areas do you feel needs the most immediate attention: the role of the MACCS in relation to Marine Corps Transformation, the concept of employment for anticipated technology available to the MACCS, the reorganization of the MACCS and specifically the direct air support function, or

the design and implementation of tactical data systems for the Transformational DASC? (*use a modified version of the SAM with these titles*)

10. Based on the answer to the previous question the follow-on question will ask: Would any of the other three factors mentioned *(show model again)* enable or drive the change to _____? (*follow up question)* If not, what do you think would?

    a. Based again on their answer to question 9, I would ask the interviewee to predict what would be most affected by a change to _____? (*Again, I could be very specific and give them the remaining two choices, or keep it general and see if the domain can be inferred form their answers*.)

11. What do think will be the critical processes that will enable direct air support for the MACCS in EMW? (*Ask for specifics, i.e. dynamic targeting in real time*)
12. Do you think the MACCS will need to reorganize? What will the DASC look like?
13. What skills will be required of ASCO/ASNOs in the future? How will they be different/the same as today?
14. What positions were manned within the Division Main DASC during OIF?
15. What positions did you hold? (*write them down*)
16. For position A whom did you communicate with external to the DASC? (*write them down)*
17. For agency/unit AA, what types of information did you receive from them? *(write them down)*
18. How was information AAA received?
19. Who did you pass that information to first?
20. How was that information passed?
21. Was there anyone else?

22. How was information AAB received?
23. Who did you pass that information to first?
24. How was that information passed?
25. Was there anyone else? (*continue until all types of information have been identified and traced*)
26. For agency/unit AA, what types of information did you send to them? (*repeat these questions until all external agencies have been identified and all incoming/outgoing data from this position has been traced)*
27. For position B, whom did you communicate with external to the DASC? (*repeat the process for all positions held)*
28. Other than the ones we've already identified, were there any other tactical data/IT systems you used during OIF?
29. What did you use _____ for?
30. What other systems did ____ interact with?
31. To what extent?
32. How was the tactical data network maintained?
33. What training did/have you received on _____?

LIST OF REFERENCES

Burn, J. & Szeto C. (2000). A comparison of the views of business and IT management on success factors for strategic alignment. Information and Management, 37.

Chairman of the Joint Chiefs of Staff. (2003). Chairman Of The Joint Chiefs Of Staff Instruction 3170.01C: Joint Capabilities Integration And Development System; Department of Defense.

Department of Defense. (2003). Transformation Planning Guidance.

Garrity, E. & Sanders, G. (Eds.). (1998). Information Systems Success Measurement; Hershey, PA: Idea Group Publishing.

Henderson, J. & Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations. IBM Systems Journal.

Hough, LtGen Michael A. (2003). State of Marine Aviation. Marine Corps Gazette.

Kowal, J. (1988). Analyzing Systems. New Jersey: Prentice-Hall.

Lederer, A.L. & V. Sethi. (1988). The Implementation of Strategic Information Systems Planning Methodologies. MIS Quarterly, 12(3).

Lee, T.W. (1999). Using Qualitative Methods in Organizational Research. Thousand Oaks, CA: Sage.

Luftman, J. (Ed.). (1996). Competing in the Information Age: Strategic alignment in Practice New York: Oxford University Press.

Luftman, J. and Brier, T. (1999). Achieving and Sustaining Business-IT Alignment. California Management Review, 1(42).

Morton, M. (Ed). (1991). The Corporation of the 1990s: Information Technology and Organizational Transformation New York: Oxford University Press.

Papp, R., & Luftman, J. (1995). Business and I/T Strategic Alignment: New Perspectives and Assessments, Proceedings of the Association for Information Systems, Inaugural Americas Conference on Information Systems.

Papp, R., Luftman, J., and Brier, T. (1995a). The Strategic Alignment Model: Assessment and Validation, Association of Management - 13th Annual International Conference.

Secretary of Defense Donald Rumsfeld. (January, 2001). Speech presented at The Pentagon, Washington, DC. http://www.intellnet.org/speeches/2001/s20010126-secdef.html. 07/2003.

Secretary of Defense Donald Rumsfeld. (January, 2001a). Speech presented at The White House, Washington, DC. http://www.intellnet.org/speeches/2001/s20010126-secdef2.html. 07/2003

Richards, L. (1999) Using Nvivo in Qualitative Research. Thousand Oaks, CA: Sage.

Rosenthal, R. & Rosnow, R.L. (1991). Essentials of Behavioral Research: Methods and Data Analysis (2nd Ed). Boston, MA: McGraw-Hill.

United States Marine Corps. (1999). The Marine Air Command and Control System and Operational Maneuver from the Sea, Part Two: MACCS Employment Options. Headquarters, USMC.

United States Marine Corps. (2000) Marine Corps Strategy 21. Headquarters, USMC.

United States Marine Corps. (2001). Expeditionary Maneuver Warfare: Marine Corps Capstone Concept; Marine Corps Combat Development Command.

United States Marine Corps. (2001a) Marine Air Command and Control System Handbook, MCWP 3-25.5. Marine Corps Combat Development Command.

United States Marine Corps. (2002). Marine Corps Order 3900.15A: Marine Corps Expeditionary Force Development System. Headquarters, USMC.

United States Marine Corps. (2001). The Marine Air Command and Control System and Expeditionary Maneuver Warfare, Part One: The Roadmap. Headquarters, USMC.

United States Marine Corps. The STOM Concept of Operations (STOM CONOPS). Draft. Marine Corps Combat Development Command.

Venkatraman, N. (1994). IT-enabled business transformation: From automation to business scope redefinition. Sloan Management Review, 2(35).

Yin, R.K. (1994). Case Study Research: Designs and Methods. Thousand Oaks, CA: Sage.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Ft. Belvoir, Virginia

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, California

3. Marine Corps Representative
   Naval Postgraduate School
   Monterey, California

4. Director, Training and Education, MCCDC, Code C46
   Quantico, Virginia

5. Director, Marine Corps Research Center, MCCDC, Code C40RC
   Quantico, Virginia

6. Marine Corps Tactical Systems Support Activity (Attn: Operations Officer)
   Quantico, Virginia